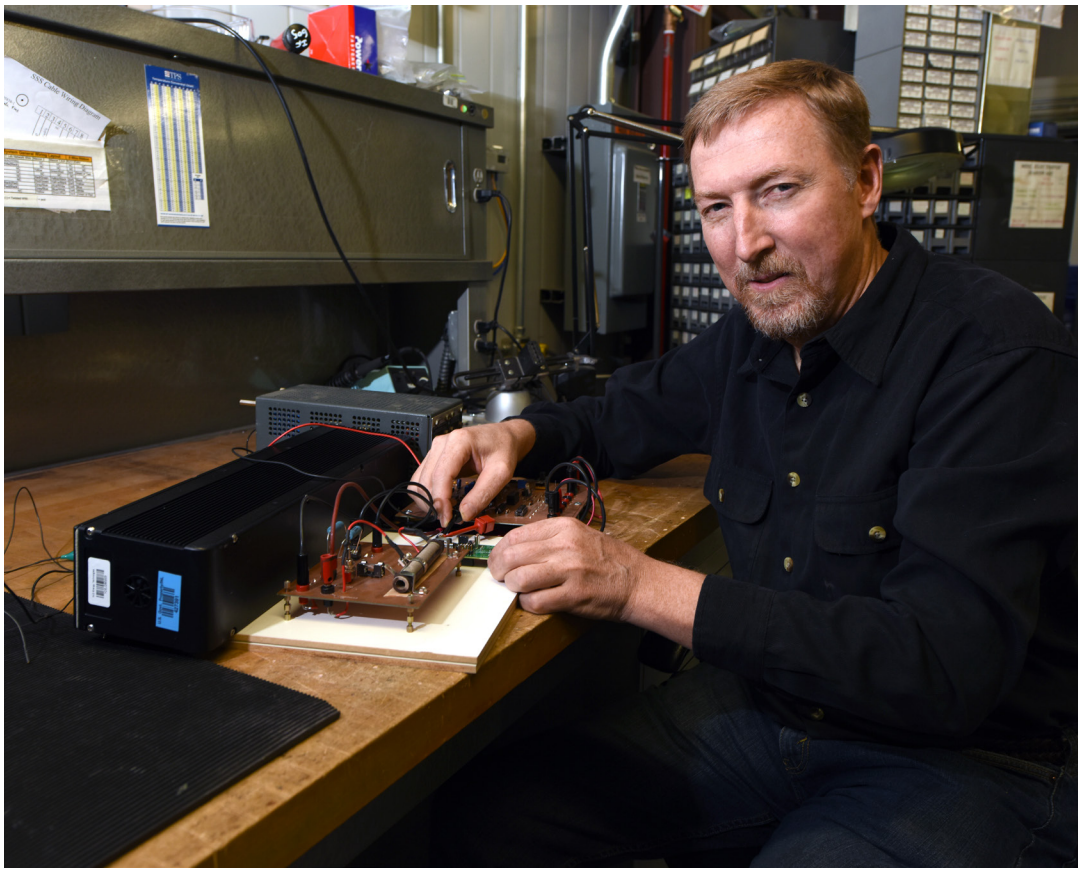

The work on Active Measurement Cancellation has taken place at INL's Energy Storage Technology Laboratory, where battery and battery cell research has been ongoing since the mid-1980s.

Active Measurement Cancellation

Measuring battery assembly performance without interruption

Technological Marketing Summary

A battery pack is only as strong as its weakest cell. As battery packs become larger and more integral to the stable operation of devices and systems that we rely on every day, the need to monitor battery dependability and performance in real time and without interruption has become more important. When a battery fails, it is typically because it has built up too much internal resistance to supply a useful amount of power to an external load. It is impossible to directly measure internal resistance of a device connected to a larger system. With conventional circuit measurement methods, resistance is derived by measuring rapid changes in voltage and current. The need for rapid signal changes and an embedded current measurement shunt create difficulty in adequately assessing impedance during realistic operating conditions.

Technology Description

Active Measurement Cancellation (AMC) is a real-time method for directly measuring impedance without the use of an imbedded system shunt. No post-measurement calculations are necessary. It involves connecting a measurement unit to one section of a battery string and unit to a separate section. In an operating battery string, the added effects of the separate positive and negative measurements add up to zero. The two measurement points can accommodate standard impedance measurement equipment such as a simple handheld digital volt meter. Cells are measured in place, and the measurement signal sees only the resistance between the measurement terminals. Measurements can occur at any time, whether the battery module is charging, discharging or resting.

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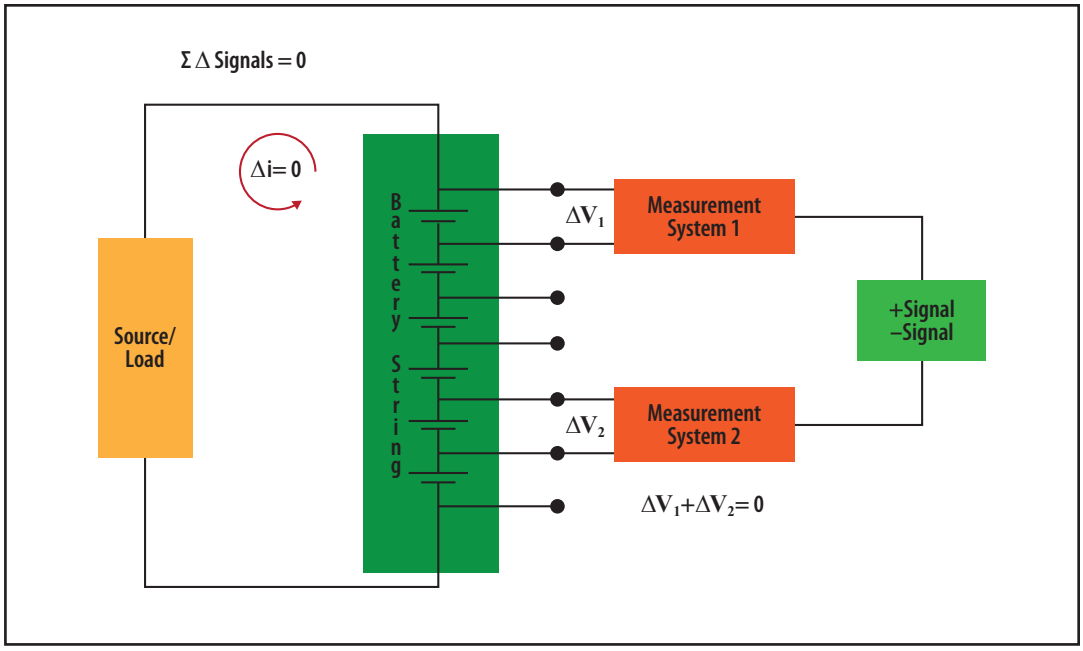


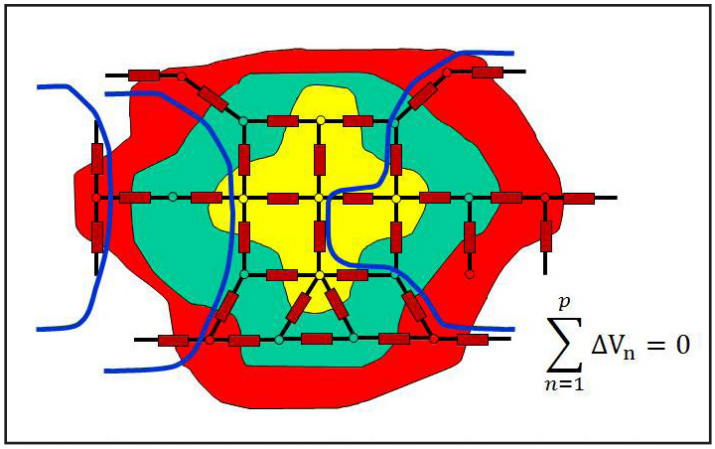
Active Measurement Cancellation uses two measurement points in a battery string and eliminates the need for post-measurement calculations.

Technological Benefits

- More accurate measurements on active systems, due to application of a physics-based principle.
- Versatility. Impedance is used as an indicator of system state and integrity from cracks in concrete structures to beam stress indicators.
- The ability to measure impedance of a component, in situ, without modifying the circuit, can save labor costs.
- Battery state of health measurement.
- Uninterrupted and unimpaired operation of battery module.
- Greater insight into polarization effects.

Potential Applications

Battery management systems, electrochemical impedance spectroscopy systems, integration into systems already offered by commercial partners, and identifying battery state of health in active electric vehicle battery systems.



ΔV_n gradients are externally imposed on the circuit by measurement and measurement cancellation units.

U.S. Patent No 9,519,031, "Circuits and methods for impedance determination using active measurement cancellation."

For more information

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