SENSOR SMART EMBEDDED NETWORK of SENSORS with OPTICAL READOUT

PARC is developing a cost-effective solution for embedded high-fidelity, real-time battery sensing to provide unprecedented accuracy in measuring State of Charge (SoC) and State of Health (SoH).

Today's battery management systems rely on external readings, such as voltage and current, to estimate a battery's internal conditions. These indirect measurements are not a precise predictor of true internal conditions, leading to batteries that are larger, heavier, and more costly than truly required. PARC is currently developing an advanced battery sensing system to reduce inefficient battery oversizing and to improve operational safety.

Smart Embedded Network of Sensors with Optical Readout (SENSOR)

PARC has combined its novel fiber-optic sensor technology with its deep expertise in intelligent algorithms to develop a system that enables real-time measurement of a battery's internal conditions. Fiber-optic sensors offer high performance yet are inexpensive and well-suited to the harsh environment within a battery. However, their use has been limited because the read-out units are too costly.

PARC’s compact wavelength shift detector is significantly smaller and less expensive than today’s commercially available optical read-out units, while retaining excellent sensitivity (<50 fm) and being able to scale up to 1000 multiplexed sensors, and monitor at frequencies up to 10kHz. With this key enabler, fiber-optic sensors can now be cost-effectively embedded into each battery cell to measure internal parameters directly. The result is unprecedented accuracy of SoC and SoH measurements to more fully utilize a battery’s potential.

Build SENSOR into Your Systems

SENSOR can also be applied to other applications, including harsh environment sensing, aircraft engines, and downhole oil/gas monitoring.

Contact PARC Business Development to learn more about how PARC can help you benefit from the increased performance, affordability, and safety provided by SENSOR. Videos and more information are available at www.parc.com/sensor

Contact PARC to learn more: engage@parc.com

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KEY FINDINGS:

CELL-LEVEL STUDIES

- Monitors critical SoX features
- Cell failure precursors detectable
- Signal stable across xEV scenarios:
  - Repeatable across C rates
  - Cold, hot temperatures
  - Rapid dynamic cycles
  - Robust to vibrations

MODULE-LEVEL VALIDATION

- xEV-grade FO-cells fabricated
- <2.5% SoC accuracy in module:
  - US06, UDDS cycles
  - Cold, hot temperatures
- <2% accurate SoH 10 cycles ahead

PATH TO FIELD DEPLOYMENT

- >1100 cycle life of FO-cells
- Cell seal, FO sensors not affected
- Cost-performance model indicates (for PHEVs):
  - 10 -12% pack cost saved
  - 20 lbs. lightweighting
  - $150 - 300 SENSOR cost

-15°C test result on xEV cell: C/10, D/2 ~50% DoD accurately sensed by FO

SENSOR: ready for evaluation, further testing

OEM validation testing in larger modules/packs starting soon

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