LI-ION TAMER® SENSOR MOS APPLICATION IN BESS MODULAR CUBES CASE STUDY

July 2025
Doc. No. 38239_00

Contents

Battery Energy Storage System (BESS) Challenges

This Case Study outlines the Li-ion Tamer Sensor Multi Output Solution (MOS) installation in lithium-ion battery modular cubes for a global Chinese BESS manufacturer.

Lithium-ion batteries are inherently fragile and are prone to failure which can lead to damaging fires. A lithium-ion battery failure happens in three stages:

- Abuse (thermal, electrical, mechanical)
- Initial venting of electrolyte vapours (off-gassing)
- Fire (thermal runaway)

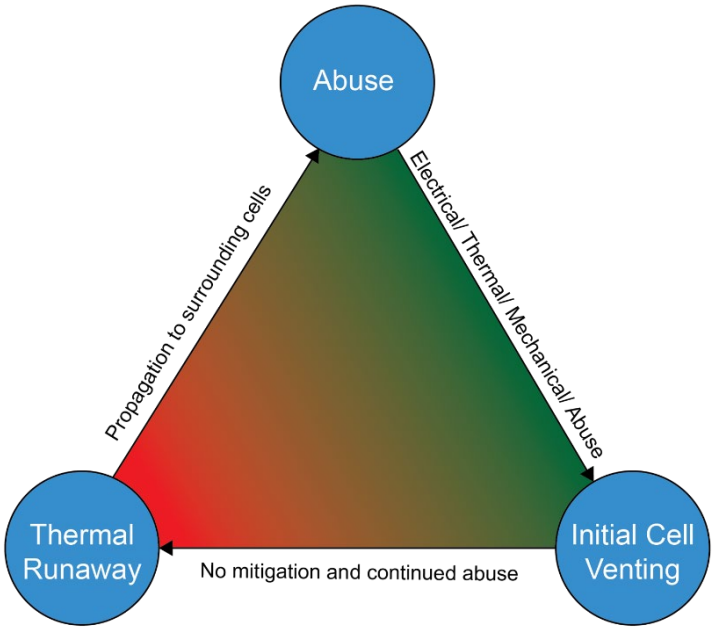

Figure 1: Lithium-ion Battery Failure Journey

Once a battery undergoes thermal runaway, the generated heat will cause thermal abuse to the surrounding batteries, causing them to also go into thermal runaway. This is why li-ion battery failures are often costly and catastrophic, a failure originating from a single battery can destroy the entire BESS.

Application

The BESS application consists of 10 x li-ion battery modular cubes (5.01kWh each) housed in a 20-foot container.

Figure 2: Battery Modular Cube

Figure 3: 20-Foot BESS Container (10 x Battery Modular Cubes)

Solution

The Li-ion Tamer Sensor MOS solution was chosen as a dual-capable sensor to provide very early warning of lithium-ion battery failures, before the onset of thermal runaway, and explosion prevention in accordance with standards such as NFPA 855 and NFPA 69. Being both a UL 2075 listed and FM 6540 approved gas detector, the Li-ion Tamer Sensor MOS is uniquely positioned to meet the gas detection needs of BESS applications with reliable and robust electrolyte solvent vapour (VOC) and hydrogen (H_2) detection. The MOS also utilizes advanced, proprietary algorithms, built on more than 15 years of experience with lithium-ion battery failures and applications to enhance the removal of nuisance alarms while maintaining high-sensitivity and performance, which is difficult to achieve with other VOC detectors.

One Li-ion Tamer Sensor MOS unit (sensor, interface module) was installed in each modular cube (10 in total for the BESS container) with the sensor placed on the top of the cube and the interface module networked to the container Fire Alarm System (FAS) via relays.

In the event of Li-ion Tamer Sensor MOS activation, power is automatically removed from the batteries of the affected modular cube to mitigate against further abuse and allow the best chance to prevent further escalation of the threat. Further, the Li-ion Tamer Sensor MOS also initiates ventilation to remove combustible vapours and gases from the space for explosion prevention.

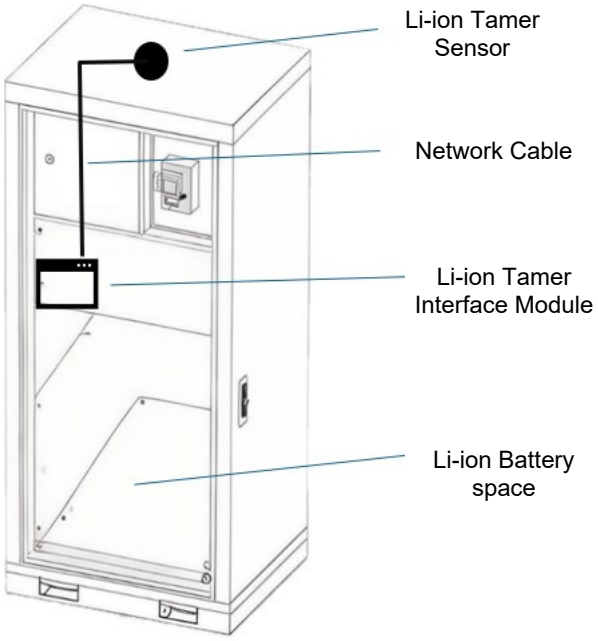

Figure 4: Li-ion Tamer Sensor MOS Installation in Modular Cube

Conclusion

The Li-ion Tamer Sensor MOS built on the recognized Li-ion Tamer detection technology is the ultimate safety solution for the protection of li-ion BESS applications.

The Li-ion Tamer Sensor MOS system provides the earliest possible warning of imminent battery failures by detecting the off-gas phase (FM 6540 approved) that occurs early in the failure mode of lithium-ion batteries. An alert to a battery off-gas event enables investigation and proper mitigation steps to be taken at an early stage to avoid progression to the most catastrophic phase (thermal runaway) which can pose serious threat to occupants' safety, damage assets/ property and resulting in loss of capacity of delivering power to customers. It also can help users comply with explosion prevention requirements, such as those in NFPA 855 and NFPA 69, with its UL-listed hydrogen detection capability.

The Li-ion Tamer Sensor MOS with its advanced detection capabilities, calibration-free and 10-year sensors' lifespan, multiple integration capabilities including relays, Modbus, and CANbus communication makes it an indispensable solution for the safe and efficient operation of BESS facilities.

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