LI-ON TAMER

FIRE SAFETY FOR LITHIUM-ION BATTERIES

SUREFIRE MAKING THE WORLD A SAFER PLACE







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EARLY INDICATION OF FIRE

Protect your property and people

As technology evolves focusing on speed, big data and mobility, the importance of reliable portable power is massive and steadily on the rise. This is why lithium-ion batteries are used to meet global energy demands.

Li-ion batteries are poised for big gains in data center UPS Systems, and are already used extensively in energy storage, warehouse storage facilities, fork lift charging and manufacturing.

Whilst li-ion battery use is set to rise even further, fire safety is still a major concern. Fires can be devastating, and often the Fire Service will leave the fire to burn itself out rather than tackling it.

Li-ion battery fires can arise from:-

- Overcharging
- Battery misuse or abuse
- Exposed to high temperatures
- Manufacturing defects
- Short circuits





To understand what causes these fire incidents we have to understand how these batteries operate. Batteries contain an electroylete and the purpose of this liquid is to allow the lithum ion energy particles to float freely. The particles are able to move from positive to the negative when charging and the reverse when the energy is being used. Critically the two ends are kept apart internally by a 'separator'.



When the separator is damaged, a chain of events occur:-

- Overcharging creates a chemical reaction between the electrolyte and the electrode. Changing electrolyte to gas.
- Overheating heats up the electrolyte and chemicals inside causing a change in state from liquid to gas.

- Exothermic reaction begins causing the separator to degrade.
- When the separator is breached, it causes a short circuit
- Thermal runaway occurs

Thermal Runaway occurs most often in a battery when the rate of internal heat generation exceeds the rate at which the heat can be expelled. The battery is therefore self fueling, hence the difficulty in suppressing the fire once it starts.









Traditional fire systems are excellent at detecting smoke, but this is already too late as the chain of events is too far along the critical path. Gas detection systems could also be considered, however due to differing densities of gases and the positioning required, the quantity of gas detectors within a battery cabinet would make this prohibitive.

The Li-on Tamer system from Surefire is capable of detecting the off-gassing and is the only viable solution. Early warning of off-gas events enable proper mitigation steps to be taken to avoid progression to a catastrophic thermal runaway failure.

The Li-ion Tamer Rack Monitoring System comprises of off-gas sensors and controllers.

Off-gas sensors are very sensitive to Li-on battery off-gassing compounds. There are two types of off-gas sensors; Monitoring Sensors whch are installed at the battery racks to monitor off-gas events and Reference Sensors to monitor the ambient environment and air inlets to cancel common mode signs to aovid nuisance alarms. Controllers process and manage the sensor signal, providing digital and serial outputs for networking to fire control panels and building management systems.



The off-gas sensors can be easily deployed throughout the space and detect failures without electrical or mechanical contact of battery cells. Sensor response can be easily verified with a bump test kit without the need of specialised gas test equipment and test gases.

The Li-ion Tamer Battery Rack Monitor provides an essential early warning signal that is used to integrate with other safety systems to initiate appropriate response processes to reduce the risk from thermal runaway.



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