

LAND

AMETEK[®]

APPLICATION NOTE

FIRE PREVENTION IN BATTERY STORAGE

Fires and explosions in battery storage facilities are on the rise as the energy density of lithium-ion batteries increases and more energy storage systems are being installed globally.

Lithium ion batteries are susceptible to a dangerous process called thermal runaway, a self-accelerating, uncontrollable increase in temperature leading to fire or explosions, that can be triggered by overcharging, physical damage, overheating, or short circuits. Thermal runaway poses significant risk to battery storage due to its rapid escalation and potentially catastrophic consequences.

HOW THERMAL RUNAWAY DEVELOPS

1. **Initiation:** An internal or external event (e.g., overcharging, physical damage, or overheating) triggers the initial rise in temperature.
2. **Acceleration:** The temperature rise causes internal chemical reactions that generate more heat. If this heat is not dissipated effectively, it leads to further increases in temperature.
3. **Critical Temperature:** Once the battery reaches a certain critical temperature (which varies based on cell chemistry and could be as low as 70 °C), the exothermic reactions become self-sustaining.
4. **Runaway:** The battery rapidly heats up, potentially reaching temperatures above 1000°C in seconds to minutes. This can lead to venting, smoke, fire, or explosion.

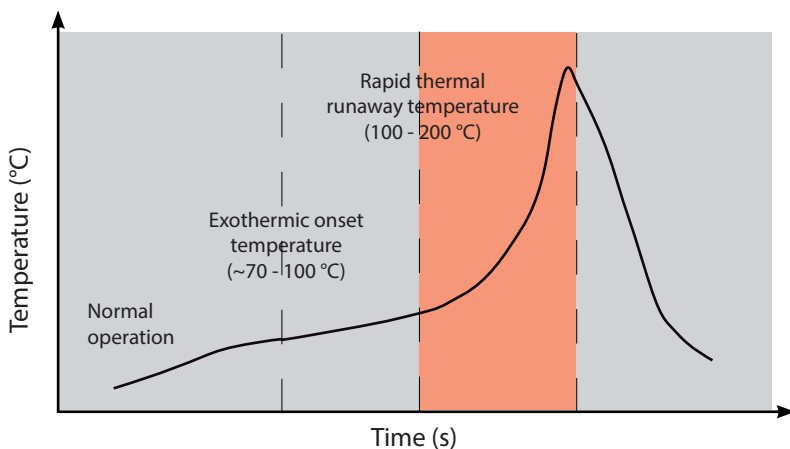
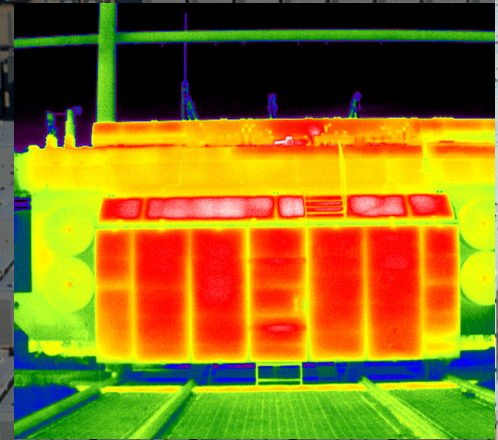
THERMAL IMAGING GIVES EARLY WARNING OF THERMAL RUNAWAY

Fixed thermal imaging has emerged as a valuable tool for monitoring battery installations. Infrared cameras measure the temperature emitted by everything in their field of view.

Infrared cameras are installed to capture detailed thermal images of the battery modules or racks to continuously monitor for any signs of abnormal heat distribution. Hot spots, temperature differentials between individual cells or modules, or uneven thermal patterns across the battery array can all indicate potential issues. A single cell experiencing thermal runaway may exhibit a significantly higher temperature compared to its neighbouring cells, which will show up as a distinct hot spot in the thermal image.

By implementing continuous 24/7 monitoring and detecting these anomalies at an early stage operators can take proactive measures to address underlying issues and prevent thermal runaway from progressing further.

This may involve isolating the affected cells, adjusting the system's cooling or ventilation mechanisms, or even replacing faulty components before they pose a greater risk.



DID YOU KNOW?

An extinguished battery fire must still be closely monitored as the internal reactions within the battery can reignite the fire.

THE SOLUTION | LWIR-640



The AMETEK Land LWIR-640 smart radiometric thermal imager is the complete thermal runaway detection system.

Early Detection: The critical temperature at which thermal runaway is inevitable and unstoppable can be as low as 70 °C depending on the battery chemistry. The LWIR-640 is accurate to 1.5% or 2 °C of reading and can detect temperature changes and anomalies in equipment at a pixel resolution of 640 x 480 (> 300,000 pixels) ensuring that you will know about any temperature anomalies when they are still small and preventative action can be taken.

Alarm Triggering: Integrated with a fire detection system, the LWIR-640 can trigger alarms or alerts when it detects temperature anomalies associated with thermal runaway, using its on-board smart functionality. This enables swift response and intervention to prevent catastrophic events.

Continuous Monitoring: The LWIR-640 can be installed in strategic locations to continuously monitor equipment prone to thermal runaway.

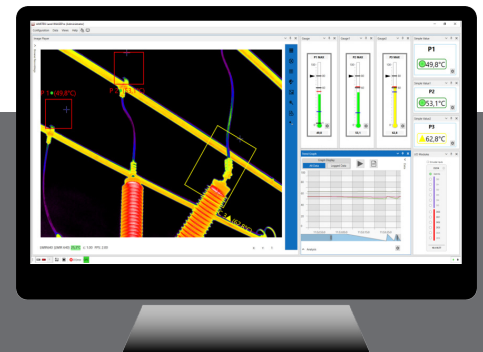
Onboard webserver and I/O: An integrated webserver with multiple I/O options enables the camera to be used autonomously or easily integrated into new or existing process control systems. The webserver provides easy camera access, control, and setup, using a standard browser.

Data Logging and Analysis: LWIR-640 combined with IMAGEPro can record temperature data over time, providing valuable insights into the thermal behaviour of equipment and facilitating post-incident analysis. This data can be used to refine predictive models and improve preventive measures against thermal runaway fires.

The LWIR-640 long-wavelength thermal imager builds on more than 20 years of thermal imaging experience. The available models offer a full temperature measurement range of -20 to 1000 °C (-4 to 1832 °F) in three ranges, with a choice of mounting and enclosure options.

DID YOU KNOW?

Firefighters use specifically designed Class D fire extinguishers and sand to smother the fire depriving it of oxygen, and absorb heat.



IMAGEPro SOFTWARE

IMAGEPro image and data processing software offers real-time analysis of thermal images, and enables monitoring and configuration of up to 16 imagers.

LWIR-640 FEATURES

- High-resolution radiometric thermal images
- Wide ambient temperature range
- Configurable areas of interest
- Embedded web server with basic image processing built in
- Optional IMAGEPro software for advanced image processing functions

LWIR-640 BENEFITS

- Detects thermal runaway early with 2 °C accuracy
- Triggers alarms for rapid response on temperature anomalies
- Continuous monitoring for early hotspot detection
- Records data for analysis and incident prevention.
- User-friendly software control

OTHER FIRE PREVENTION SOLUTIONS

CONVEYOR SYSTEMS

HotSpotIR 9000 is a compact, fixed-focus, high-speed scanning system specifically developed to detect hot inclusions on conveyor belts.

Designed for industrial environments, it rapidly identifies hot material on a moving conveyor, preventing damage and avoiding costly shutdowns.



PULVERISERS

Millwatch detects the rapid build-up of CO in a horizontal or vertical-axis mill, giving a continuous indication of the CO concentration.

User-selectable alarm relays give an additional warning that a hazardous condition is developing.



STORAGE SILOS

Silowatch rapidly detects the build-up of carbon monoxide (CO) in storage silos for coal and biomass fuels, providing a continuous indication of the CO concentration.

If the CO level reaches a user-set limit, the instrument alarms to allow preventative action to be taken before a fire starts or an explosion occurs, increasing plant safety and reducing downtime.



AMECARE
PERFORMANCE SERVICES

AMETEK Land's AMECare Performance Services ensure peak performance and maximum return on investment over the life of your equipment.

We will deliver this by:

- Proactively maintaining your equipment to maximize availability.
- Optimising solutions to meet your unique applications.
- Enhancing user skills by providing access to product and application experts.

AMETEK Land's global service network provides unparalleled after-sales services to ensure you get the best performance and value from your AMETEK Land products.

Our dedicated service centre teams and on-site engineers are trained to deliver the highest standard of commissioning, maintenance and after-sales support.

FIND OUT MORE AT: WWW.AMETEK-LAND.COM

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