Enhancing safety: Advanced Linear Heat Detection System for Asian Battery Storage Facility

The Scenario

A leading distributor of electrical components, including lithium-ion batteries, faces unique safety challenges. While lithium-ion batteries are generally safe, they can emit toxic fumes if they catch fire. In the event of thermal runaway, a rapid and uncontrollable reaction can cause the fire to spread quickly, leading to a chain reaction that is difficult to contain. Unlike conventional fires, extinguishing a lithium-ion battery fire may require up to five times more water, making it a particularly complex hazard to manage.

Client Requirements

The client required a state-of-the-art fire detection system to ensure safety in their facility, which stores lithium-ion batteries in multi-story bays within high, three-dimensional warehouses. With 400 bays in total, these enclosed spaces pose challenges for conventional fire detection technologies like beam detectors, video flame detection, and aspirating systems. Initially, the client considered installing low-cost smoke detectors in each bay, but they also sought a solution capable of detecting heat rise before thermal runaway occurs and before smoke is emitted, ensuring early intervention and minimising the risk of a fast-spreading fire.


Figure 1: Storage bays

Monitored | Secured | Safe

What Did We Do?

The solution provided was a fiber optic-based linear heat detection system designed to run inside each of the storage bays. By positioning the sensing fiber close to the lithium-ion batteries, the system can detect small changes in heat, allowing for early detection before thermal runaway occurs. This early warning enables prompt action, where a stacker crane removes the affected battery tray from its bay and transports it to an isolation area inside an explosion-proof container. Once isolated, the tray is treated with Novec 1230 extinguishing gas to safely suppress any potential fire.
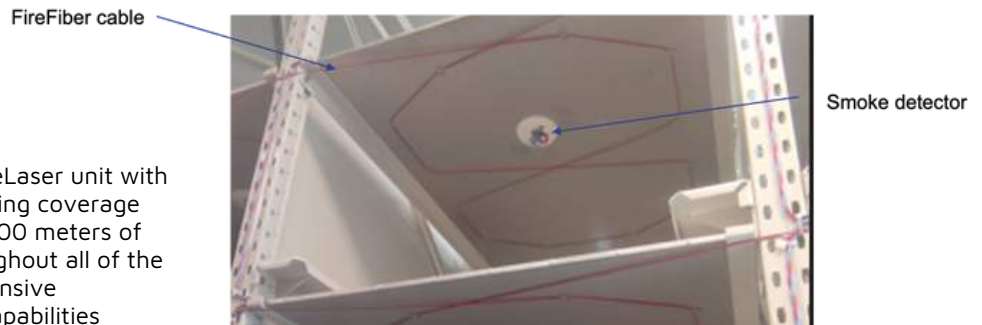
The solution included a single FireLaser unit with a 2 km range per channel, providing coverage across two channels. In total, 3,000 meters of sensing cable was installed throughout all of the storage bays, ensuring comprehensive monitoring and early detection capabilities across the facility.

Figure 2: Sensing cable layout and smoke detector within bay

Figure 3: Sensing cable set up throughout storage bays with single FireLaser unit

The system was programmed with smart alarms and smart zones, with each storage bay designated as an individual zone. The smart alarms included three key configurations: maximum temperature, rate of rise, and deviation. The maximum temperature alarm is set to a user-defined threshold, typically 30°C above ambient, to detect high heat levels. The rate of rise alarm is configured to rapidly identify any sudden increases in temperature, usually set between 7 to 10°C per minute, allowing for quicker detection than the maximum temperature setting. The deviation alarm detects any irregular temperature changes from the average, typically set at 5-15°C from the norm, making it ideal for identifying slow-burning fires that may not trigger a rate of rise alert. Fully integrated with the fire alarm control panel (FACP), this system enables the fire protection system to respond swiftly and accurately, focusing efforts precisely where needed.

Benefits To the Client

The Bandweaver system complied with the operator's high specification requirements. Some of the key following benefits and advantages to the end user include:

- **Reliable and robust system**: With a lifespan of over 30 years. It is immune to electromagnetic interference (EMI) and unaffected by dust or particles, ensuring reliable performance in challenging environments. Additionally, it features no orifices that can become blocked and has no moving parts, minimizing the need for maintenance and reducing the risk of failure.

- **Simple to install:** The system is simple to install, utilising a single, lightweight, and flexible cable that can be easily routed throughout the facility. It requires no in-field power or communication infrastructure, making the setup process quick and cost-effective. This streamlined installation approach reduces both time and expense, ensuring minimal disruption during deployment.

- **Quick detection with low false alarm rate:** The system's smart alarms enable quick and accurate detection of potential issues while minimizing the occurrence of false alarms. This early-warning capability allows it to identify problems before thermal runaway occurs, ensuring timely intervention and enhancing safety measures.

About Bandweaver Technologies

With an installed base of over 60,000km and 8,000 systems installed worldwide, Bandweaver's vision is to be the first choice for integrated distributed fiber optic sensing solutions across the globe. Since 2002, Bandweaver has been committed to delivering reliable, innovative, client-centric, and value-added products and services, via a dedicated and talented team of people.

Bandweaver manufactures and distributes advanced fiber optic monitoring sensors and integrated technologies, enabling customers to monitor, secure and keep personnel and critical assets safe.

With quality and excellence as fundamental elements of Bandweaver's portfolio, the business is continuously developing its range of technologies, including Distributed Temperature Sensors (DTS), Distributed Acoustic Sensors (DAS) and integrated smart intelligent software solutions. Bandweaver provides solutions for Security, Fire, Power, and Pipelines. For further information please contact our global team at info@bandweaver.com