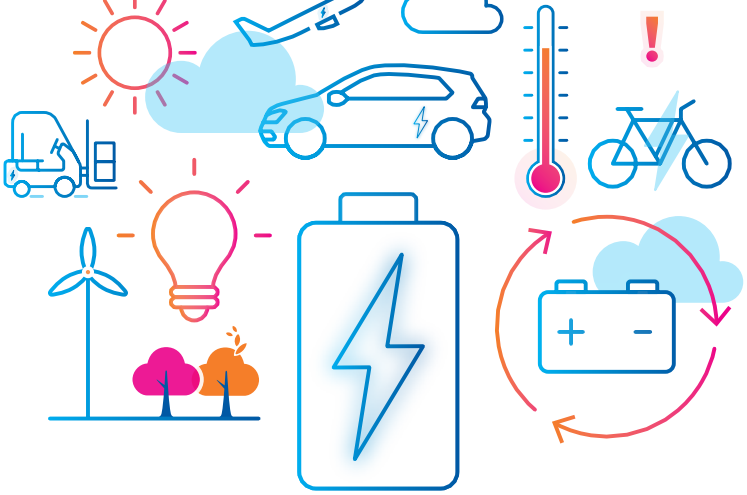


Risk Solutions

Managing Lithium-Ion battery returns

Lithium-Ion (Li-Ion) batteries are in common use in a variety of industrial and consumer settings – and convert chemical energy into electrical energy to store energy. Many guidance articles have been published about the safe handling and charging of devices that contain Li-Ion batteries including e-scooters and e-bikes – but this guidance focuses on managing the 'returns' of devices/equipment containing Li-Ion batteries, either from rentals or purchase.

Types of batteries

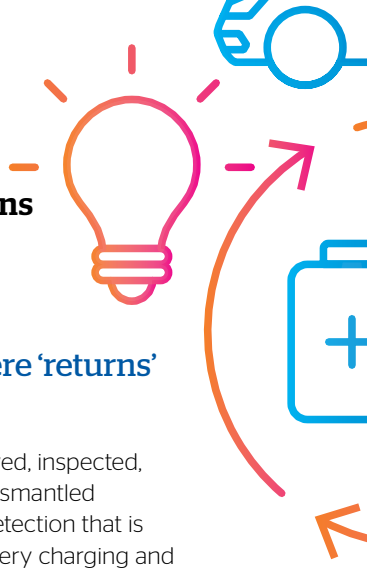
There are two types of batteries – primary and secondary. Primary batteries are non-rechargeable and are frequently referred to as single-use batteries. Secondary batteries are rechargeable.

In Li-Ion batteries, the ions inside the battery can move in two directions: from the anode to the cathode while discharging and from the cathode to the anode when recharging. Rechargeable Li-ion batteries are used in mobile phones and laptops, and larger versions power electric vehicles (EV) and cars alongside e-scooters and mobility scooters.

Battery returns

Used Li-Ion devices/equipment returned to a retail store, repair workshop or manufacturer accepting end-of-life WEEE (Waste Electrical & Electronic Equipment) can be at greater risk of causing major fires from thermal runaway, especially when compared with handling and storage of new and unused batteries.

Using a Li-Ion battery device exposes the battery cells to shaking, impact shock and the potential for being connected to poor quality or faulty chargers, triggering internal faults that lead to self-heating and thermal runaway. Returns in a commercial and industrial setting therefore present a greater hazard than new and/or unused batteries.



QBE's 10-point checklist for managing Li-Ion battery 'returns':

1. All 'returns' should be delivered to an external yard area or a low value building 15m+ from the main buildings OR delivered to a 1-hour fire-rated container/building 6m+ clear.
2. 'Returns' should not be brought inside main buildings for cleaning, testing or refurbishment until the workshop is ready to accept them.
3. 'Returns' brought into main buildings for inspection and testing should not be left unsupervised at any time of the day.
4. 'Returns' should not be left inside the building out of hours or when the work area is unsupervised such as at breaks, overnight and weekends.
5. Returned batteries should be checked with hand-held thermal cameras for signs of over-heating on receipt and before being brought into main buildings for inspection and testing.
6. 'Returns' should not be discharged or charged until all electrical tests have been completed and this should be done for the first time ONLY during supervised work periods.
7. For small units, removed batteries should be placed in a metal lidded box positioned in a safe space inside the work area or outside the building, not in the main store, warehouse, or factory.
8. The small battery 'returns' box can contain sand or vermiculite as a means of limiting the immediate effects of a returned battery going into thermal runaway.
9. The contents of this small battery 'returns' box should be removed from the main building at least every 4 hours and preferably every 2 hours, whether or not the box is full. It is imperative that 'returns' are not left in the main building for too long when they might be faulty.
10. Batteries extracted from large units such as vehicles and mobile plant should be removed from the main buildings immediately and stored in the open 15m+ from the main buildings OR stored inside a 1-hour fire-rated container/building 6m+ clear.

Guidelines for buildings where 'returns' are handled:

- All buildings where 'returns' are received, inspected, tested, cleaned, refurbished, and/or dismantled should be fitted with automatic fire detection that is interlocked to isolate power to all battery charging and discharging equipment and any other test equipment or power supplies.
- Automatic sprinklers should be installed. This is the most effective method to contain a fire that develops when Li-Ion batteries go into thermal runaway and to protect the building and business. However, sprinklers will not stop thermal runaway, only act as a means of fire containment and raising an automatic fire alarm.
- Fire alarms raised by fire detection, sprinklers and manual call-points should be remotely monitored at least out of hours using Dual Path signalling with at least 10-minute polling for Fault Monitoring.
- Security measures should be installed for the main buildings to minimise the risk of theft of Li-Ion battery powered devices, equipment, and vehicles. Many devices using Li-Ion batteries are desirable and portable, and so are attractive to thieves. The security alarms should be remotely monitored out of hours using Dual Path signalling with at least 10-minute polling for Fault Monitoring.

Managing Lithium-Ion battery returns

If a fire and thermal runaway event should occur:

- The priority for people is to evacuate safely and to call the Fire Brigade. Stay at least 10m away from the device on fire because Li-Ion batteries can explode, sending hot metal fragments many metres in all directions.
- Manual fire extinguishers suitable for Li-Ion batteries can be provided in the workshop area; however, employees must ONLY use these fire extinguishers to assist themselves and others to escape safely. The white coloured vapour that is released initially is not smoke; these are flammable gases looking for a source of ignition and can explode at any moment. The darker coloured gases that are released as batteries burn are toxic and extremely harmful to people.
- If firefighting is undertaken by trained employees, they should only do so when wearing Breathing Apparatus (BA), they should stay 3m+ clear of the device and should focus on suppressing flames on burning materials around the battery and not on the battery itself. Suppressing the flames on the burning battery converts a fire hazard into a much more dangerous explosion hazard. The preference is to let the battery burn itself out.

The types of businesses that operate a proactive Returns Policy or offer equipment rental or equipment repairs/refurbishment/recycling can be involved with a range of battery sizes.

Small to medium sized Li-Ion battery powered devices/equipment can include mobility scooters, e-scooters, e-bikes, hand-held tools, laptops, tablets, and mobile phones. At the larger scale this could include battery energy storage systems (BESS) in place of diesel generators, or self-powered security cameras, lighting and safety equipment. Cars, trucks, buses, cranes, MEWPs, forklift trucks and construction mobile plant such as loaders, backhoes, dump-trucks can also fall into this category.

This non-exhaustive list crosses a wide range of social, commercial, and industrial uses of Li-Ion batteries. Businesses should consider whether 'returns' and the associated hazards already form part of a daily risk assessment. If they do, 'returns' should be managed as if every battery could be faulty and go into thermal runaway. Li-Ion incidents are unpredictable across all sectors and caution is required wherever Li-Ion batteries are used, re-used and recycled.

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