Early Onset Detection: Thermal Runaway Detection

Master thesis project

Source: https://batteryfiresafety.co.uk/what-causes-lithium-ion-battery-fires/
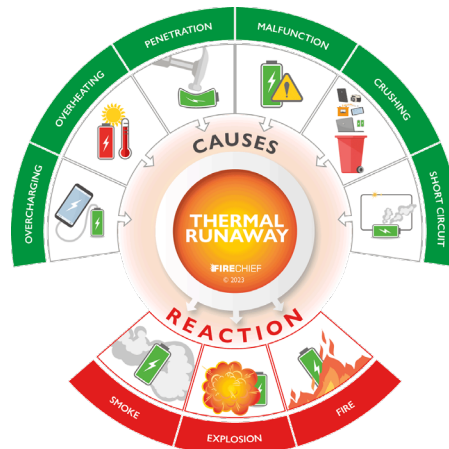
Summary:

The aim of this thesis is to detect the early onset of thermal runaway to prevent a safety event from occurring before it actually occurs

Problem definition:

In battery storage systems the main safety risk is a thermal runaway condition that can occur due to internal shorts in a cell, too high temperature or overcharging. To prevent these events, safety measures are taken to ensure the cells are never overcharged nor operated at elevated temperature. However, it is still possible due to other factors such as aging and production defects, to cause a thermal runaway.

Method:

In this study, we aim to investigate the monitoring and detection of battery parameters including EIS to prevent a fire and safety event from occurring in batteries.

Research objectives:

1. Perform a literature survey on safety related issues (overcharging, internal short circuit, faulty temperature operation (too high/ too low) – specifically leading to thermal runaway and related safety hazards
2. Model the battery cells within a pack including sensors for battery parameter detection and BMS for monitoring and for real-time safe operating area monitoring
3. Perform simulations and build a suitable model for emulating the real conditions for such faulty operations
4. Validate the simulations, for mitigation and prevention of battery-related faulty conditions and also for the performance of the safety monitoring systems

Courses and supervision:

This is a a challenging, simulation oriented battery modelling project. Background of EE , power electronics and battery-related knowledge and courses are considered mandatory.

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