The never-ending dilemma of safety testing

A few miles down the road from the Novi exhibition centre Intertek had an open house session at its Plymouth testing centre.

Intertek offers every type of test imaginable, and if it has not previously been imagined, they can custom-build test apparatus. As a company it operates laboratories for the textile, footwear, toys, petroleum and chemicals industries at 500 locations worldwide.

The site in Plymouth, Michigan, deals exclusively with commercial and electrical testing for electromechanical components, including cells and batteries with a capacity less than 6 kWh.

As with any form of battery testing, the multiple standards agencies are disparate and need harmonisation to be useful for EV battery standards. As a progressive area of research and development with new products becoming available all the time it is little wonder the standards agencies can't keep pace with the chemistries and applications.

Rich Byczek, Global Technical Lead, EV & Energy Storage, spoke on the subject of electric vehicle battery standards about dealing with 'stranded energy' in electric vehicle batteries after an accident.

Byczek's talk largely highlighted the holes in existing standards and areas that manufacturers will have to consider and engineer around in order to have a battery that not only passes safety standards, but also is safe operating in non-controlled environments.

The Electric Vehicle Standards Panel has identified several gaps in the existing ANSI standards, primarily relating to thermal runaway and stranded energy. Firstly, a lack of standards for the safe storage of large format lithium-ion batteries— that react very differently to small batteries— for warehouses, salvage yards dealers etc.

In relation to packaging, handling and transport, waste batteries are not considered in the current regulations and standards. This would include damaged, used, warranty return batteries, and their potential contact with other goods in the same shipment. Recycling standards present a large gap for lithium-ion because there are currently none.

The existing standards for overheating only focus on immediate results, not delayed overheating that can occur after a crash or abuse scenario, which could lead to problems if a battery is held in intermediate storage after an accident. A pass or fail test for over-heating does exist, but only for the time of an incident, not a delayed reaction.

Manufacturers and standards agencies must understand the hazards different size and type of battery packs, as well as chemistries and applications could present.

Stranded energy could cause problems for people working at the site of a crash, whoever takes a damaged car away for repair or disposal. Understanding how to deal with cars that are still a minority on the roads— if a roadside assistance team saw one electric car a month it would be high— has obvious problems. Let alone different vehicle types... it is easy to see why there are gaping holes in the standards when there is no 'standard EV' or even 'standard' battery.

Another problem with testing is the conditions are different to real-life use. In a controlled environment a battery might react very differently to being submerged then over-heated, or punctured or crushed in a moist environment.

Although a battery could pass a test in a controlled environment as stipulated in the standards, there's no way to simulate every potential situation a battery could be exposed to. The potential threats must be understood and mitigated for safe handling of the battery.

Byczek had a few suggestions to deal with stranded energy, first was the suitcase tester, a piece of kit to be used by vehicle recovery teams that has diagnostic and discharge capabilities. Users would need training to assess what energy is left in the battery, and discharge with the equipment.

However as there is no 'standard battery' it would be difficult for a kit to be suitable for all types of EVs. Byczek said auto-manufacturers were reluctant to harmonise, even as a safety issue, because it could be damaging to proprietary rights.

Another potential solution is to implement a device to automatically self-discharge and disconnect the system and then begin a slow discharge following a crash.

However, with both of these options, there is no guarantee a battery would be accessible after an accident, and for the auto discharge the greater the damage the less able it would be to respond.

This goes to highlight just how dangerous a battery could be following an accident, or even exposure to the elements. It also underlines the challenge of setting standards in an area with so many variables.

This problem is not going to be solved easily. Harmonisation of standards agencies would be a good start, but achieving this on a global scale will never be achieved before the technology itself once more outpaces the regulations.