

Managing the risks of electric shock in heavy vehicle repair starts with awareness, and moves on from there, finds Toby Clark

EV SAFETY

A hybrid or all-electric commercial vehicle operates at high voltage – typically around 600V, or around 25 times higher than the 24V of a conventional truck or bus. For example, the Dennis Eagle eCollect refuse collection vehicle operates at 406V to 605V DC, with five 600V batteries each rated at 60kWh capacity. Yet voltages as low as 50V can be lethal, either due to direct causes (heart attack, internal burns or other muscle damage) or indirectly (for example, a fall). Even lower voltages can cause sparks which may result in fire or explosion.

Clearly, while we may have become blasé about the considerable hazards of internal-combustion vehicles, there is no excuse to ignore electrical dangers.

The training bodies have responded with specific schemes for EVs: the IMI has an established a three-level set of qualifications for those working with smaller EVs (cars and vans), and last year worked with the IRTE to add an EV module to the irtec vehicle technician qualification (see box).

Dennis Eagle has adopted its own rigorous set of safety procedures. Aftermarket director Geoff Rigg explains: "There's no industry standard, and that's why we've created one. We are keen that our customers adopt those standards, and so far that's what they've been doing." Rigg says that it is concentrating not just on the competence and training of staff, but also the necessary



DENNIS EAGLE TRAFFIC LIGHT SYSTEM

The vehicle OEM uses a three-colour traffic light system to indicate vehicle condition:

- Green: the vehicle is safe to work, as the high-voltage battery has been isolated or removed
- Amber: the vehicle is normally functioning and active – however, the state of the vehicle must be determined before it is worked on
- Red: the vehicle is live and access is restricted – it is either damaged, faulty or in a state of disassembly. Staff should not approach it unless they are a trained & HV (high voltage) authorised person
- If there is no sign on the vehicle, staff should assume that it is in the amber condition.

equipment. For instance, it has fully-equipped safety boards and a more portable safety case: "If they haven't got either of those they cannot work on a vehicle."

"We've worked with a specialist in electric systems and had some discussions with IRTE and we've shared what we're doing, but we have our own in-house academy and we're making it specific to our product,"



Dennis Eagle's Electric Vehicle Safety Equipment Board includes: insulated gloves, voltage indicator and proving kit, eyewash station, hydrofluoric acid burn kit, rescue hook and optional emergency defibrillator

adds Rigg. Dennis Eagle has trained about 90 engineers to foundation level, while a core of engineers at its in-house and off-site service centres have had advanced training; this will build up as the number of eCollect vehicles (pictured) increases.

RISKS

The obvious risk is electric shock. PPE is a relevant mitigation method here. For example, there are insulated gloves complying with EN 60903:2003 ('Gloves and mitts of insulating material for live working'). There are different ratings, but Class 0 – rated to 5,000V – is typical. These are usually made of rubber and have a finite working life. Non-conducting work boots are also advised. Less commonly, non-conducting overalls are also available.



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IRTEC ACCREDITATION

The irtec large electric vehicle accreditation process is intended ‘for technicians involved in the isolation, reinstatement and safety [of] high voltage driveline systems’. The process is aimed at experienced technicians working on trucks or buses, and is split into two phases.

First, the applicant must pass an online multiple-choice test, lasting 45 minutes. As Dave Skelly, irtec product specialist at the IMI, puts it, “If you haven’t got the knowledge, there’s no point in doing the competency test!” Once they have passed the knowledge test, they can book a practical assessment overseen by an examiner. This involves demonstrating the correct and safe methods and using the appropriate equipment and information to isolate a large electric vehicle’s HV system – allowing others to work on the vehicle – and then to reinstate the HV electrical system, confirming that it is a fault-free state ready to hand over to a customer. The examiner will then ask a series of questions to confirm the technician’s knowledge.

The main principal when working on live or potentially live HV electrics is to never work alone; if somebody is electrocuted, there must be a colleague around to raise the alarm and (if possible) get them away from electrical power. This is why HV safety kits include an insulated ‘shepherd’s crook’ at least a metre long to drag an unconscious colleague away from danger.

A common rule, unless you are certain of the state of the equipment, is not to approach within one metre of a high-voltage battery. While it is unlikely that a spark will arc very far across an air gap at the typical voltage levels of an electric vehicle, a dropped tool could cause serious problems.

And batteries are not the only components which remain hazardous: for instance, capacitors may also retain a substantial charge.

Other hazards include burns and chemical contamination from damaged batteries; manual handling issues –

HV batteries are several times heavier than conventional batteries; and the risk of collision. EVs are almost silent in operation – people may be unaware of movements.

CONTROL

Summing up, Geoff Rigg observes: “It’s all about management control to me. Inherently it’s safe if you know what you’re doing. The whole purpose is to make sure the vehicle is identified for what it is and there’s a safe system of work.”

This training is important even when working on non-electrical systems, adds Rigg: “If our guys were working on a hydraulic pump close to high-voltage cabling, because they have that awareness, they would isolate the truck.”

Satnam Cheema, group engineering director at bus operator Tower Transit London, has plenty of experience with safety around high-voltage vehicles. He says: “We put this in place years ago, because we operated hydrogen fuel cell vehicles and hybrids.” Now Tower Transit operates Volvo and ADL hybrids, and is introducing full-electric Optare Metrodecker double-deckers with 300kWh batteries. “High voltage vehicles are a different animal to a normal diesel bus,” says Cheema.

Tower Transit London has a safety management system certified to the ISO

45001 occupational health and safety standard. “Locally, we have health and safety meetings once a month, and we have walk-arounds of the depots – that’s come from a culture of operating hydrogen vehicles, where you don’t get a second chance!”

Each site has a safety board with equipment specific to electric and hybrid vehicles (it uses Reece Safety Products’ electric and hybrid vehicle intervention kit), and zones off special areas in the workshops for these vehicles.

“When we introduce vehicles, as a minimum we will have training from the manufacturer: every employee who could have contact with a HV vehicle, from a cleaner or a shunter who might plug in the charging cable, gets IMI level 1 generic [electric vehicle awareness] safety training,” says Cheema. “Master technicians are trained to IMI level 3 – hybrid vehicle repair and replacement – and this was done by Volvo.” Most of the training is done in a designated space in the fleet’s own workshops, he points out: “We have to have the vehicle available, and we always try to do it on site – it’s easier to pay the trainer to come to us”.

Cheema adds that the majority of its engineers have irtec licences, but an irtec licensing programme was put on hold during the pandemic. “Our target is to have all engineers irtec-licensed.” **TE**

