Safety Alert

Preventing battery explosions

Guidance about preventing explosions from starter batteries fitted on back-up diesel engine systems (powering emergency generators, fire booster pumps etc) in buildings.

November 2012

Background

There have been a number of battery explosions recently, involving automotive starter batteries fitted to back-up (emergency) diesel engine systems.

Fortunately no-one has been injured from these incidents. However such explosions have the potential to inflict serious injuries, such as permanent blindness, and can be the cause of building fires.

Investigations by WorkSafe indicate the explosions were not related to an accident or a by-product of maintenance processes at the time of the explosions. The explosions have typically occurred several months after the battery was installed.

In each instance, the batteries involved were the larger automotive 'maintenance free' type with no provisions for periodic topping up with water of the electrolyte (internal acid fluid), and of a size typically fitted to heavy duty trucks, agricultural plant etc.

'**Maintenance free**' is a misused description for starter batteries. Even where batteries do not require periodic water additions, maintenance requirements still extend to charging, cleaning battery tops, periodic re-tightening of battery connections, testing to confirm the working condition of the battery etc.

According to the Australian Battery Industry Association (ABIA), this type of automotive battery is designed for starting, lighting and ignition (SLI) duties in vehicles where battery state of charge is maintained by the vehicle alternator but only during times when the engine is running.

In such applications, charge received from the alternator is offset with partial discharges from repeat starting, 'engine off lights on' periods etc.

ABIA advises automotive type batteries are not designed for applications that involve continuous float (trickle) charge as is almost always the case in diesel engine powered back-up applications.

When subjected to constant charging, the usual benign end of working life and failure modes experienced by automotive type batteries on trucks etc are replaced by an increased risk of explosion due to internal changes in the battery, largely related to placing such batteries under continuous charging.

WorkSafe investigations and consultation with industry sources shows that:

- 'maintenance free' automotive type batteries that cannot be periodically topped up with water, in conjunction with constant float charging, are not suitable for standby diesel engine starting applications
- operating starting batteries at temperatures above 25°C will lead to higher water loss and shorter service life. The higher the temperature, the greater the rate of water loss and shorter the service life
- 'maintenance free' automotive type batteries that cannot be periodically topped up with water in conjunction with constant float charging can produce explosions with the associated potential of injury to anyone present and the risk of fire.

Control measures for starter battery solutions in back-up diesel engine applications involving constant float charging:

- avoid using automotive type 'maintenance free' batteries that have no provisions for periodic top-ups with water and/or monitoring of liquid levels in all cells for back-up diesel engine systems involving constant float charging
- use stationary type batteries in back-up diesel engine applications. Stationary battery formats are custom designed for constant charge applications and all 'vented' formats provide for visual monitoring of the electrolyte level
- use constant voltage chargers. When operated at the recommended charging voltage, they maintain the battery at or near full capacity and provide automatic replenishment of charge following a discharge
- if valve regulated lead acid batteries (VRLA) are utilised in applications where average temperatures will be regularly above 25°C, charger voltage output control should have temperature compensation provision in accordance with the battery manufacturer recommendations
- wherever possible, the starter battery should be located in the coolest position available
- any worker undertaking battery maintenance or working in the near vicinity of a battery or batteries should at the very least, wear eye protection at all times.

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Information and training

Ensure service operators are informed and trained for:

- carrying out all battery manufacturer recommended maintenance, including checking and maintaining electrolyte levels in batteries where applicable
- identifying installations involving automotive type 'maintenance free' batteries or that are otherwise unsafe, and instigating a replacement program with correct battery and/or electrical systems
- avoidance of ignition sources (sparks, flame etc) when working near batteries
- regularly checking the condition of the battery for physical damage or deterioration
- dealing with battery damage should acid leakage occur or explode the battery
- wearing of appropriate personal protective equipment (PPE).

Note: For the purpose of this Alert:
- **'Automotive batteries'** are batteries used for passenger cars, commercial and industrial vehicles for normal use, commercial and industrial vehicles for severe use, and are batteries for use in deep-cycling applications (eg marine use, taxis and coaches) - as detailed in the scope of the latest edition of AS2149 *Starter batteries-lead acid*.

- **'Stationary batteries'** are batteries that are designed for service in a fixed location (ie not habitually moved from place to place) and are permanently connected to the load and to the DC power supply - as detailed in the scope of the latest editions of AS4029 (AS4029.1, AS4029.2, AS4029.3) *Stationary batteries - lead acid* and AS3731.(AS3731.1 and AS3731.2) *Stationary batteries - nickel cadmium*.

More information

The Australian Battery Industry Association (abia.org.au) is the representative body for manufacturers, importers, distributors and wholesalers of automotive type batteries throughout Australia. Membership is responsible for approximately 95 per cent of automotive battery sales.

Contact details

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