

Safety Alert

Mines Inspectorate—Underground metalliferous mines

Safety Alert No. 280 | 18 January 2012

Emergency refuge bay explosion

What happened?

A periodic inspection of an underground Rescueair emergency refuge bay (ERB) found that an explosion had occurred inside. It is believed that an explosive atmosphere was created by the hydrogen generated when the EverExceed® VRLA (Valve Regulated Lead Acid) batteries were overcharged.



Outside of the ERB after the incident



Batteries from the ERB

Why did it happen?

Factors contributing to the incident include:

- EverExceed® battery-charging system did not switch off when manufacturer's fully charged battery voltage was reached.
- Overcharging the batteries produced hydrogen which, in this case, vented into the ERB.
- Location of batteries inside the ERB.
- ERB inspection procedure was not followed correctly by personnel.
- Gas was ignited by an unknown energy source. Flammable limits of hydrogen in air are 4 to 74% by volume.

The batteries were housed under a seat within the ERB. The gas expelled from the overcharged batteries was circulated around the airtight ERB by the air-conditioning unit. While the ignition source hasn't been positively identified, the battery charger is suspected. Other potential ignition sources inside the ERB include lights, two-way radio and an air conditioner.

ERBs form an integral part of an underground mine's emergency response plan and system. The site safety and health management system must ensure that ERBs are installed, operated and maintained according to Original Equipment Manufacturer (OEM) recommendations. Where OEM recommendations are not followed, suitable risk and change management processes must be applied to ensure that the risk remains at an acceptable level.

Recommendations

1. Inspect all ERB battery and battery-charging systems to ensure that they are compatible with, and installed and operating within, OEM specifications.
2. Ensure that all ERBs are subject to scheduled inspection and maintenance by suitably qualified personnel, covering OEM specifications as a minimum.
3. Regularly inspect batteries for signs of gasification (swelling) or other defects such as cracking of cases and deterioration of terminations.
4. Relocate batteries to a place where flammable gases cannot accumulate.
5. Use batteries that do not expel hydrogen in the event of overcharging.
6. Install battery cell monitors on each battery to ensure that the internal impedance of the battery is within acceptable limits. Where a defect is detected, initiate an alarm.

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