

Safety Alert—Battery Explosion

Incident

Recently an employee was using a Dewalt brand DCG412 4 1/2” grinder to grind a stainless steel hose clamp on a work bench in Crop Services building. The work bench also served as a location for charging various batteries for tools and for charging a vented lead-acid battery (Exide Stowaway Dual Purpose Battery Part #24MDPST). Vented Lead acid batteries generate hydrogen gas while being charged so when the employee went to grind the hose clamp the gas venting from the battery was ignited, exploding the battery and spraying the employee with a mixture of water and sulfuric acid.

Corrective Actions:

1. Batteries should only be charged in well ventilated locations. Failure to do so results in accumulation of hydrogen gas which is highly flammable.
2. Any form of hot work (welding, grinding, etc.) should be conducted at least 35 feet away from flammable or combustible materials.
3. Any refilling or battery maintenance must be conducted within 10 feet, unimpeded of an eyewash station as there is potential for splashing onto skin and eyes. Proper personal protective equipment must be worn during these tasks.
4. Any use of grinders requires eye protection that is ANSI Z87.1 rated to be worn. The ANSI Z87.1 ratings ensure the protection can withstand impacts from projectiles associated with grinding. Standard eyeglasses DO NOT meet this requirement unless they are labeled as such. It is recommended safety glasses and a face shield are worn together while grinding.



Photo 1: Ruptured Exide battery



Photo 2: Location where employee was grinding. Battery was positioned near vise prior to incident.

Safety Alert—Battery Explosion (cont.)

Characteristics of Lead Acid Batteries

Lead acid batteries are relatively common large capacity rechargeable batteries. They are used in automobiles, electric vehicles, boats, etc. These batteries are composed of a number of individual cells that contain layers of lead alloy plates immersed in an electrolyte solution. The electrolyte solution is typically comprised of 35% sulfuric acid and 65% water.

There are two categories of lead acid batteries:

- **Vented Lead Acid (VLA or spillable, photo 3)** - VLA batteries have negative and positive terminals on the tops or sides, as well as vent caps on the top. The vent caps allow gases (hydrogen and oxygen) to escape while the battery is charging. Water is lost to evaporation during normal usage and the vent caps allow electrolyte levels to be checked for maintenance.
- **Valve-regulated (VRLA or sealed, photo 4)** - VRLA batteries are sealed because they do not allow for the addition or loss of liquid. These batteries have safety valves that allow pressure to be released when a fault condition causes internal gas to build up faster than it can be recombined.

What are the hazards of batteries?

Chemical Hazards—The electrolyte solution in lead acid batteries contains sulfuric acid which is highly corrosive and can cause severe chemical burns to the skin and can damage the eyes. This solution is poisonous if ingested. Overcharging of a lead acid battery can produce hydrogen sulfide gas (H₂S) which has an odor similar to rotten eggs and is flammable.

Fire/Explosion— Lead acid batteries vent little or no gas while being used (discharging) but explosive amounts of hydrogen and oxygen can be produced during charging, particularly with VLA batteries. Hydrogen gas is colorless, odorless, lighter than air, and highly flammable. Oxygen is an oxidizer that can promote a fire or explosion. If VLA batteries are charged in a room with poor ventilation, hydrogen gas may accumulate and present a fire or explosion hazard.

Electrical shock— Exposed battery terminals can cause electrical shocks even when disconnected. Batteries can contain a significant amount of stored energy and some battery systems can discharge high rates of current. Shorting of the terminals can result in severe electrical arcing.

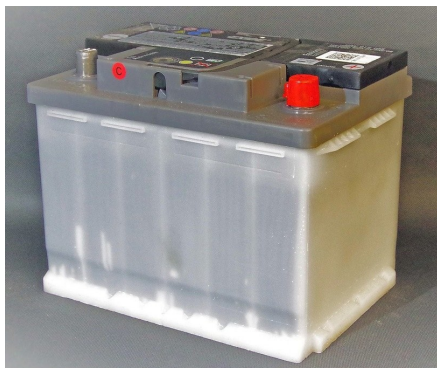


Photo 3: VLA type battery



Photo 4: VRLA type battery

Contact your Research or Workplace safety partner with questions or contact UHS at (612) 626-6002 or uhs@umn.edu.