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Emerging Risks of Lithium-Ion Battery Powered Hand Tools

by Scarlett Sadler

Lithium-ion batteries have become a staple in powered hand tools due to their compact size, portability, and long run time. For public agencies, including maintenance, facilities, parks, and emergency response, these tools can be instrumental in supporting efficient operations in the field. However, while convenient, lithium-ion batteries present unique safety risks that can lead to injury, fire, equipment damage, or facility loss if not managed correctly.

A lithium-ion battery-powered hand tool typically has a removable rectangular battery pack, often labeled with terms like “Li-ion” or “Lithium-Ion,” and may display a voltage rating such as 18V or 20V MAX. These batteries usually snap into the bottom or back of the tool and are recharged using a docking station. Unlike traditional batteries, lithium-ion cells store a high amount of energy in a small, sealed unit, which makes them efficient but also increases the importance of proper handling and storage. Recognizing these features helps ensure that battery-powered equipment is managed safely.

Lithium-ion batteries introduce several safety concerns relevant to public agency operations. One of the most critical is thermal runaway, a condition where internal overheating, caused by manufacturing defects, prolonged use, or overcharging, triggers a chain reaction that can lead to fire or explosion. Hand tools also face a high risk of physical damage, as frequent drops or impacts in the field may compromise the battery’s structural integrity. Improper charging or storage practices, such as using incompatible chargers or placing charging stations near combustible materials, can increase the likelihood of failure. Additionally, the use of uncertified or off-brand batteries and chargers introduces potential electrical hazards due to inconsistent safety standards or a lack of protective features.

Preventive measures play a critical role in reducing the risks associated with lithium-ion battery-powered hand tools. The following best practices for safe use should be considered:

Storage and Handling

Lithium-ion battery powered hand tools and batteries should be stored in cool, dry areas, preferably at room temperature, and kept away from direct sunlight, heat sources, vehicles, or flammable materials. Batteries should be removed from tools when not in use, especially during transport or storage, and placed in padded or durable containers that won't be punctured. Never stack batteries or store them loosely where the exposed metal contact points that connect the battery to the tool or charger, known as terminals, could touch metal surfaces. When batteries reach the end of their life, they should be disposed of properly, such as through a certified e-waste or hazardous waste program. They should never be placed in regular trash or standard recycling bins due to the risk of fire or contamination.

Identify Faulty Batteries

Train staff to recognize and report batteries or devices that exhibit unusual signs, such as being unusually hot, swollen, bulging, leaking, discolored, emitting strange odors or sounds, or producing smoke. If a battery exhibits any of these signs, it should be isolated and stored in a fire-resistant container, away from any flammable materials. Tools and batteries should be regularly inspected for signs of wear, swelling, cracks, or corrosion. Contact points should be kept clean and free of debris, and any damaged components should be removed from service immediately. If a battery starts smoking or catches fire, evacuate the area and call 911 immediately. Be sure to inform emergency responders that lithium-ion batteries are involved.

Charge Smart

To reduce the risk of overheating, fire, or battery failure, lithium-ion batteries should always be charged using equipment that is either from the same manufacturer or specifically approved for compatibility. Third-party or aftermarket chargers should be avoided, as they may not meet required safety standards. Batteries must be removed from chargers as soon as they are fully charged and should never be left connected for extended periods, such as overnight or for multiple days, as this increases the risk of malfunction or thermal runaway. Charging should take place in supervised, well-ventilated areas and never in hallways, stairwells, near exits, or in direct sunlight, where conditions may add to the risk or block emergency evacuation routes.

Always follow the manufacturer's instructions for charging, storage, and replacement when working with lithium-ion batteries and powered hand tools.

Emergency Response

Safe work practices surrounding lithium-ion battery hazards should be established to ensure staff are prepared to respond safely and effectively in the event of an incident. This includes identifying areas where batteries are charged or stored and installing smoke or heat detectors nearby to provide early warning of potential issues. Facilities should be equipped with appropriate fire extinguishers, and staff must be trained on how and when to use them. When possible, use fire-resistant containers and isolate batteries that are overheating or appear damaged. Do not touch or move hot batteries unless it can be done safely and without risk of injury.

Creating a safe environment for the use of lithium-ion battery-powered hand tools requires a proactive approach. By incorporating battery safety into safe work practices, providing targeted training, and ensuring proper inspection and emergency planning, agencies can reduce the risk of fires, injuries, and equipment loss. These efforts not only protect staff but also help keep tools working, tasks on track, and services uninterrupted. For questions regarding Lithium-ion batteries, contact PRISM's Risk Control.