FACT SHEET: Rechargeable Batteries

(General)

It used to be that a cordless power drill was something futuristic – now we can't imagine a worksite without one!

The jump from Nickel Cadmium batteries to Lithium-ion technology revolutionized the way we use power tools. They are smaller, lighter, last longer and have more power. There is now cordless table saws, cordless jackhammers, even cordless small engines.

This means using power tools is becoming more environmentally friendly.

This also means we need to be up to date with how to handle them.

READ ALL Safety Instructions that come with your batteries before you use them!

Basic Use

- Use power tools only with the battery packs made for that tool. Use of any other battery packs may cause injury or fire.
- Recharge only with the charger made for that tool. A charger that is made for one type of battery pack may cause a fire when used with a different battery pack.
- NEVER force the battery pack into the charger. DO NOT modify the battery pack to fit into a non-compatible charger. The battery pack may rupture causing serious injury.
- Do not place any object on top of the charger or place the charger on a soft surface that might block the ventilation - this can cause it to over-heat. Keep the charger away from any heat source.
- If the charger is designed to operate on standard 120V household electrical power, do not attempt to use it on any other voltage.

Location

- Do not charge or use the battery pack in places with flammable liquids, gases/fumes or dust. Inserting or removing the battery pack from the charger may start a fire.
- Do not expose the charger to rain or snow. Do not allow any liquid to enter the battery pack or charger. Electric shock may result.
- When using a charger outdoors, always provide a dry location and use an outdoor rated extension cord. (An extension cord must have adequate wire size for safety – see the manual.)

Temperature

- DO NOT charge the battery pack in an air temperature below +4.5°C, or above +40°C. This is important and will prevent serious damage to the battery pack.
- Do not use the tool and battery pack in locations where the temperature may reach or exceed 40°C.
- For long life and best performance, charge the battery pack in air temperatures between 18° to 24°C. A cold battery pack will charge at a slower rate than a warm battery pack.
- The charger and battery pack may become warm to the touch while charging. This is normal. To help cool the battery pack after use, avoid placing the charger or battery pack in a warm environment.

WHEN IT'S COLD: At –20°C most batteries work at about 50 percent capacity. This means they need recharging more often and wear out sooner. Charging at this temperature is out of the question.

HOT/COLD PACK DELAY: Some chargers are able to detect a battery pack that is too hot or too cold. It will automatically start a Hot/Cold Pack Delay, so it waits for the right temperature before charging begins. This feature ensures maximum battery pack life.

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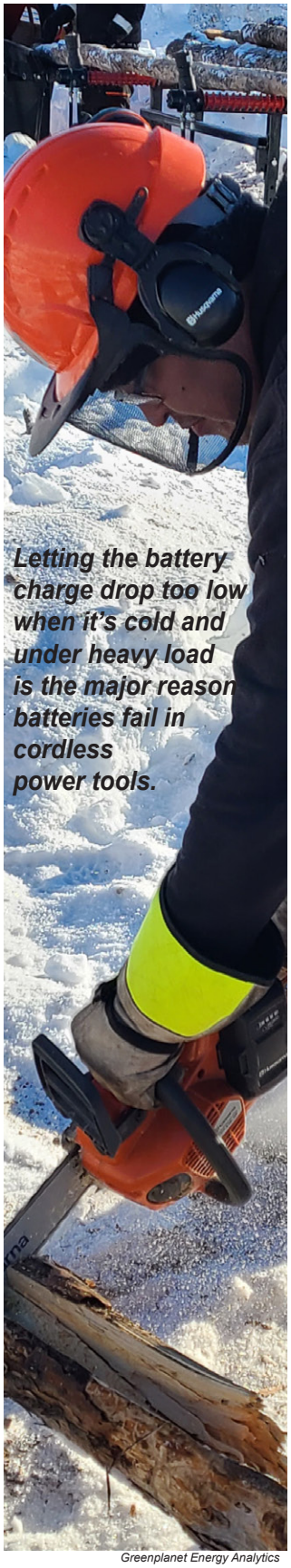
Storage

- The best storage place is one that is cool and dry, away from direct sunlight and excessive heat or cold. Do not store the tool and battery pack in locations where the temperature may reach or exceed 40 °C.
- Battery packs should not be stored without at least a partial charge.
- For long storage, it is recommended to store a fully charged battery pack in a cool dry place out of the charger for optimal results.
- When the battery pack is not in use, keep it away from other metal objects that can make a connection from one terminal to another. Shorting the battery terminals together may cause burns or a fire.



Letting the battery charge drop too low when it's cold and under heavy load is the major reason batteries fail in cordless power tools.

Greenplanet Energy Analytics

- Battery pack storage tips:
  - Avoid paper clips, coins, keys, nails, screws, hand tools or other small metal objects.
  - Do not place the battery pack in aprons, pockets, toolboxes, drawers, etc. that have loose objects.
  - When transporting individual battery packs, make sure that the battery terminals are protected.
- Protect your charger as well: grinding dust, metal chips, steel wool, aluminum foil or any buildup of metallic particles should be kept away from the charger cavities.
  - Always unplug the charger from the power supply when there is no battery pack in the cavity.
  - Unplug the charger before attempting to clean.
- Do not store the battery packs in a tool with the trigger switch locked on. Never tape the trigger switch in the ON position.
- After storage, the battery pack will need to be recharged before use.

Damage

- If damaged, liquid may be ejected from the battery.
- Battery liquid may be flammable if exposed to spark or flame.
- WARNING: Burn hazard. Avoid contact.
  - First Aid - flush with water. If liquid contacts eyes, additionally seek medical help. Liquid ejected from the battery may cause burns.
  - Battery liquid may cause respiratory irritation. Provide fresh air. If symptoms persist, seek medical attention.

Do not incinerate battery packs - they can explode.

Toxic fumes and materials are created when lithium ion battery packs are burned.

For More Information

Battery University
https://batteryuniversity.com/learn/article/bu_002_introduction

Compare Batteries

This chart provides a summary comparing the major kinds of rechargeable batteries and how they have changed.

Battery	Lead acid: Flooded, sealed, gel, AGM	Nickel-based: NiCad, NiMH	Lithium-ion: Cobalt, manganese, NMC
Best way to charge	Maintain a full charge to prevent buildup of lead sulfate crystals; can remain on charge with correct the voltage (see manual)	Avoid getting battery too hot on charge. Do not leave battery in charger for more than a few days Subject to memory*.	Partial and random charge is fine; does not need full charge; lower voltage limit preferred; keep battery cool.
Charge methods	Constant voltage to 2.40–2.45/cell, maintain charge at 2.25–2.30V/cell. Battery should stay cool, no fast charge possible. Charge time 14–16h.	Constant current, NiCad can be fast charged without stress; trickle charge at 0.05C. Slow charge = 14h, Rapid charge = 3h, Fast charge = 1h, NiCad Recommended	Constant voltage; no trickle charge; battery can stay in charger. Rapid charge = 3h Fast charge = 1h Charge at 5C or above (warm battery to room temp is best) Recommended
Discharge	Can endure high peak currents. Avoid full discharges. Charge after each use.	Do not over-discharge with a heavy load; cell reversal causes short. Avoid full discharges.	Do not discharge Li-ion too low, apply some charge after a full discharge to keep the protection circuit alive.
How to prolong battery	Limit deep cycling; do not deep-cycle starter battery. Apply fully saturation charge. Avoid heat.	Discharge batteries that are in regular use (mainly NiCad) to 1V/cell every 1–3 months to prevent memory.	Keep cool. Operate with charge at 30–80%. Prevent ultra-fast charging and high loads (most Li-ion)
Storage	Keep cells at >2.05V. Apply topping charge every 6 months to prevent buildup of lead sulfate crystals.	Store in cool place; NiCad stores for 5 years; prime before use	Store at 40% charge in cool place (reads 3.75–3.80V/cell). Do not go below 2.0V/cell.
Disposal	All batteries are TOXIC. They contain chemicals that can BURN skin and possibly EXPLODE. DO NOT BURN OR BURY. They need to be taken to a recycle facility. These batteries can be easily recycled even in remote northern communities - check your local landfill.		

Adapted from: https://batteryuniversity.com/index.php/learn/article/do_and_dont_battery_table