When cordless tools first entered the jobsite in the early 1980s, few thought they’d ever be able to compete with their “tailed” counterparts. But as batteries leapfrogged from 6 volts to 12 to 24 volts, users discovered there was little these “tail-less apprentices” couldn’t do. Today, cordless tools are the hottest-selling tools for both professionals and D-I-Y’ers. This year,
more than 2 million new cordless drills alone will hit the jobsite.

According to Jason Goger, a product specialist at DeWALT Industrial Tool Company battery and charger technology is the heart of the cordless revolution. Understanding batteries and chargers can help you select the best tool for your own type of work, and also help you protect your cordless tool investment.

**Making Sense of Volts**

The most noticeable advance in cordless tools is the ever-increasing voltage rating. The higher the voltage, the more power available at a given moment to perform the task at hand. “Higher voltage equals more energy to the motor, which means the ability to drive bigger bits and blades,” Goger says.

Despite what you may hear, bigger (voltage) isn’t always better. Plumbers, electricians and other tradesmen who run large spade bits, hole saws and auger bits may need the brute force of an 18- or 24-volt tool, but if you don’t handle that kind of work, a better option may be a compact and lightweight 12- or 14.4-volt model. “Larger tools don’t necessarily do the smaller tasks any better than a smaller tool,” Goger says. “It’s like driving a dump truck versus a compact car to the mall. Both will get you there, but the smaller car is more efficient for the task.” Goger also points out that smaller, lighter battery packs can sometimes be more comfortable to work with and are easier to use in tight spaces where bigger tools can’t fit.

After voltage, a specification to consider is the Amp-hour rating, a general number that categorizes how much operating capacity a battery has when fully charged. “If voltage is compared to the size of a vehicle’s engine, then Amp-hours is like the size of the gas tank,” Goger explains. All other factors being equal, a higher Amp-hour rating (they range from 1.2 to as high as 3.5) generally means a cordless tool can run longer or do more work per charge. It doesn’t make the tool more powerful, it simply provides the capacity to run longer between charging.
But even within the same voltage and Amp-hour ratings, Goger adds that actual performance can vary greatly between tools. “Consider what’s inside the tool,” Goger says, referring to the motor, transmission and other components that share the work. “A significant percentage of a tool’s potential can be lost within the inside mechanisms,” he says. Details such as high-quality magnets in the motor, metal gears and carbide chucks ensure that power is transferred efficiently from the battery to the bit or blade. What’s inside the battery pack is also important. Compared to professional batteries, the cells within consumer-grade batteries may degrade after as few as 20 recharges. Without actually dismantling the battery, the only way to ensure you’re getting the power you paid for is to stick with professional-quality tools.

**NiCd or NiMH Batteries?**

Until recently, nickel-cadmium (NiCd) batteries powered all cordless tools. But some manufacturers have started experimenting with nickel metal hydride batteries (NiMH) as another potential power source. In terms of Amp-hours, or run-time, NiMH ratings have a slight advantage, going up to 3 Amp-hours. The highest-Amp hour rating for NiCds is 2.4, but the potential is there to go higher.

Unfortunately, NiMH batteries currently have disadvantages that stand out on the job site. For starters, NiMHs are more temperature sensitive; the batteries may not work in temperatures below 32 degrees F, and begin to degrade quickly when exposed to temperatures above 105 degrees. Comparatively, NiCds can be used in higher temperatures without compromising cell life. Comparison tests also show that NiMH batteries last for only about half the number of recharge cycles as NiCd cells, which means NiMH cordless tool users could end up purchasing replacement batteries more often.

NiMH technology is advancing and may be more viable in the future, but many tool manufacturers continue to use NiCds because they offer the things that matter most to cordless tool users—better performance and longer pack
life—at a lower cost than NiMHs. Environmentally conscious buyers may point out that NiMHs are less toxic, but battery recycling boxes at home centers and electronic stores now provide an easy and safe way to dispose of used batteries.

**Charge It!**

Because battery chargers don’t appear to be doing any real work, they aren’t given much attention. However, without them, cordless tools would quickly become paperweights. Understanding how chargers work can help protect your tool investment.

Not all chargers are created equal. “Basic” chargers provide a continuous charge for a given period of time regardless of the battery’s status. This means that once a battery is fully charged, the charger keeps pouring energy into the pack. This unneeded energy translates into unwanted heat, which reduces the overall number of recharges a battery can take. Other basic chargers may have a thermal switch that shuts off the charger at a given temperature to prevent overheating. But recharging a warm battery will fool the charger into shutting off prematurely. In this case, the charger will indicate that a battery is charged even when it’s not. The latest generation “smart” chargers have a built-in microprocessor that diagnoses the battery, then delivers the optimum charge.

Smart charging is done in stages. First, the charger waits for the battery to cool before starting the “charging cycle.” With some chargers, like DeWALT’s newest 24-volt model, a fan cools the pack and dissipates heat so the battery can charge faster. Next, the charger performs a “fast charge.” Because the cells may charge at different rates, this stage shuts off to minimize heat build-up as the fastest charging cells reach near-maximum capacity. In the “equalization stage” the charger balances, or tops off, all the cells using a slower charge designed to add power without bringing heat. This process is like filling an ice cube tray, when you gradually turn the faucet back as water spreads into each cube opening. Lastly, a “trickle charge” replaces power ordinarily lost during periods of non-use when the battery is stored in the charger.

**Debunking Battery Myths**

**Myth 1:** Batteries have a memory effect. Tradespeople have passed along the myth that battery packs must be fully drained before recharging. According to Goger, that “memory” myth is based on cordless tools in a previous era. “Back in the 1980s, it was possible to inadvertently limit battery capacity by methodically using a tool and draining the battery the same way over and over again,” Goger says. But he adds, “Battery memory isn’t an issue today because technology has improved and tools are used for a greater variety of tasks.”

Back then, the “cure” was to clamp or tape the tool’s trigger and completely drain the battery before recharging. In reality, taping a trigger to use up every last electron does more harm than good. “When the battery drains, the weaker cells empty first,” Goger says. “The stronger cells continue to operate, but the drained cells could actually reverse polarity.” Reversed-polarity cells no longer accept a charge. This means a freshly charged 12-cell pack will only have 11 cells working—meaning shorter run time, less power and faster degradation of the remaining cells.

The best advice for cordless tool users is simply to recharge a battery as soon as they observe a drop in performance, and to keep the battery in the charger until it’s needed.

**Myth 2:** Keep batteries in the freezer. In truth, storing those extra batteries for your camera or flashlight in the cold may help keep them fresher than in a drawer. The problem is that some contractors have taken things a step further, and bring a cooler to the jobsite to store spare battery packs. According to Goger, keeping cordless battery packs cooler than 50 degrees F is unnecessary, and may be harmful. Says Goger, “Chilling the battery can fool the charger into thinking all the cells are cool when the inner cells may still be warm.” He also
points out that the added risk of getting water in the battery pack far outweighs any marginal benefit.

While they should be protected from extreme heat, NiCd batteries don’t need to be babied. “A battery’s comfortable working temperature is about the same as your own,” Goger says. “When it gets too hot for you to work, just remember to bring your batteries in with you.”

Myth 3: Batteries can be rebuilt. Some repair and electronic shops claim they can rebuild battery packs so they will perform as good as new. The problem is you may get less than what you thought you were paying for. “It’s impossible to be certain that your local electronic shop is rebuilding the pack to the same specs as the original,” Goger says. For example, not all cells are created equal. “A rebuilt battery may perform as good as new at first, but there’s no way of knowing how well those cells will accept a charge after a few dozen cycles.”

“Pros average about three years per pack,” Goger says. “At that rate, even an $80 pack costs less than 40 cents per day.” He also points out that building cost analysts have found battery-powered tools are not only more convenient, but the batteries cost less than cumbersome extension cords used to power electric tools. And when a kink or cut can turn a cord into a 120-volt jobsite hazard, cordless tools are a better way to provide extra safety and peace-of-mind.

About the Author
Joe Hurst-Wajszczuk has been writing about woodworking and tool topics for the past decade. He has appeared in American Woodworker, This Old House, Popular Woodworking, and other publications. Additionally, he has written and edited several books with Rodale and Reader’s Digest. He works from his home office/workshop in Denver.