

Lithium-Ion batteries

What you need to know about the latest in cordless-tool technology

Cordless-tool batteries have continually stepped up in voltage since they were invented nearly 50 years ago, but with each boost in power came added weight. In fact, a 24-volt nickel-cadmium (NiCd) or nickel-metal hydride (NiMH) drill can weigh nearly 8 pounds—about the same as a gallon of milk—and who wants to lug that around the shop or job site all day?

Responding to that criticism, Milwaukee Electric Tool introduced a line of 28-volt cordless tools at the International Builders Show in January. The lithium-ion (Li-Ion) chemistry used in these batteries provides more power for less weight than NiCd or NiMH cells, meaning an 18-volt drill of the

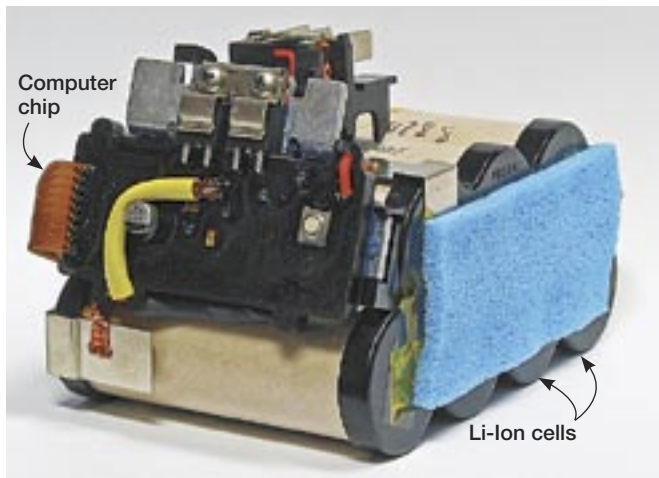
future could weigh as little as today's 12-volt drill. Also, Milwaukee engineers say Li-Ion batteries could one day make more power-hungry tools (such as big routers and benchtop planers) cordless.

Li-Ion's share: Shifting from cell phone to shop

Although the lithium-ion name may be unfamiliar to you, chances are good that you've used a Li-Ion powered device in the past few days. That's because this rechargeable battery chemistry is the power source of choice for cellular phones, digital cameras, and laptop computers. Those applications draw a small amount of energy from the battery over long periods of time,

which has traditionally been considered the forte of Li-Ion cells.

However, Gary Meyer, head of the team that developed Milwaukee's "V28" battery platform, says they've cracked the code to make Li-Ion work in high-drain applications, such as professional power tools. "Our batteries aren't the ultimate in energy delivery [which translates into run time]," he says, "but they're good enough [on run time] while vastly improving on power." How good is "good enough?" A Milwaukee representative shared with us the results of independent lab testing that showed their V28 batteries ran about twice as long as 18-volt NiCd batteries.



Besides managing the inflow and outflow of power, a computer chip inside Milwaukee's V28 "smart" battery pack also tracks charge/discharge patterns and the date of first use for service and warranty purposes.

Part of that boost, naturally, comes from an almost 50 percent increase in voltage over an 18-volt battery pack, regardless of chemistry. But the Li-Ion cells, coupled with a computer chip inside the battery pack (shown at *left*) that regulates both the charging and discharging of the pack, also get credit for improved

run time. Milwaukee's Dave Selby, manager of new product development, puts it this way: "The voltage of a NiCd battery steadily falls off as the battery discharges, giving you less power to do the job. Our batteries deliver the same power from the first pull of the trigger to the last. When the voltage falls below a certain threshold, the chip simply shuts the battery down." Engineers added a "fuel gauge" on the battery to help users tell when the pack is nearing depletion.

More power, long run time—what's not to like?

In a nutshell, cost. Prices on Li-Ion tools weren't available as this issue went to press, but Selby estimates their 28-volt tools will cost about 40 percent more than pro-level 18-volt NiCd tools. "The raw materials to make Li-Ion batteries are actually less expensive than NiCd, but the higher volume of production of NiCd batteries helps keep their cost lower," he says.

Another concern could be in *cycle life* (the number of recharge cycles over the life of the battery). Although Selby says Li-Ion's cycle life about equals that of NiCd, other portable-tool manufacturers say their evaluations of lithium manganese (the formula used in Milwaukee's batteries) suggest its cycle life is shorter than that of NiCd technology, particularly in heavy-use applications.

Looking ahead: Is Li-Ion in your tool future?

We can't fathom when we'd need a 28-volt drill in a woodworking shop; there's always an outlet and corded drill nearby for those demanding jobs. Still, we tried the Milwaukee V28 6½" circular saw in our shop, and it cut like a corded saw, without the entanglements.

We asked Dave Selby if he expects Li-Ion to trickle down to lower-voltage tools, giving consumers more power at lighter weight. "That is very much a possibility," he responded. "At this point, though, we're looking to apply it to make now-corded tools cordless." He wouldn't elaborate for competitive reasons, but says that this technology pours out up to 700 watts of power, more than twice the 300-watt cap typified by NiCd and NiMH. "That means just about any tool requiring 25 amps, up to possibly 40 amps, is a candidate." Could a cordless tablesaw be on the horizon? ♣