

# Batteries for Power Tools-- A Review Spring 2006

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Probably your first cordless tool was a flashlight, but you never even thought of it as a cordless tool. Then we got some low powered battery operated drills, B&D made the first one in 1961. However it took another 30 years before cordless got powerful enough to go mainstream. Not so long ago I wrote in this magazine that the only real changes in cordless technology were the chargers, but that has changed. Today we can barely keep up with the cordless revolution, let alone understand it because this has become the cutting edge of competition between the tool manufacturers. All corded tools have exactly the same plug on the end of the cord. Each tool is interchangeable and in the old days we tended to have a wide variety of brand name tools in our boxes. The catch with cordless is that no battery works in a different brand tool. Brand loyalty is the dream of tool manufactures and now if they can get you to buy into their battery line; they have probably hooked you for a whole series of tools. The end result is that we need to study our purchases more carefully before we marry a brand. One of the biggest problems with cordless tools is the added weight. It is true that DC motors can deliver the same power in a smaller package than AC motors, hence where the tool gets heavier because of the battery; some of that weight is compensated for by a lighter motor. In fact overall weight is what limited the power of cordless tools to a maximum of 18 volts for a long time, until weight and power became more important than price, bringing fancier battery technologies into play. Hence, before we study tools, we need to study batteries, but all batteries are not created equal. Let's take a look at batteries themselves, then a quick survey as to what the various companies are proposing, at least for the moment as technology is changing so fast I may have to re-write this six months down the road.

### Battery Types

#### NiCad

NiCad has been the standard tool battery since 1961. It is relatively inexpensive, at least compared to alternatives. One major drawback is that it will lose its charge just sitting on a shelf, so you always need to charge up prior to a job. NiCad batteries fade at the end of a charge. Also NiCad batteries lose power when hot, either from use or from sunlight. Modern smart chargers have eliminated the memory problems of NiCad batteries.

#### Nickel Metal Hydrate

More power for the same size and weight as NiCad, but more expensive and shorter life span. One unique drawback for Canada is poor performance in cold weather. The Japanese manufactures embraced Nickel Metal Hydrate but before it gained serious popularity in Canada, the Lithium Ion battery came to maturity and is in the process of displacing this technology.

#### Lithium Ion

This is the technology that has always powered portable computers and cell phones, expensive little powerful batteries. Price kept Lithium Ion out of power tools until people got so hooked on cordless tools that cost took second place to weight and quantity of stored power. Lithium Ion can put more power in a smaller package than NiCad and does not have the cold temperature problems of Nickel Metal Hydrate. In addition there is no standby discharge. It gives more power per charge and more charges for the life of the battery - some claim over 300% more battery than equivalent NiCad batteries. As well it gives out just about the same power performance all the way between charges, rather than dying out slowly at the end as you have experienced with NiCad. Beauty, but with a price. It is important to note that as with most things, all Lithium Ion batteries are not equal. Remember that free or inexpensive cell phone you got, that wouldn't hold a charge very long? When you replaced the battery, not only did the battery cost more than the phone, but it worked better. Lithium Ion is a category of technologies and the different manufacturers use different variants of that technology -- as if it wasn't complicated enough to try and compare offerings already. For the same voltage with the same Lithium Ion label you can get different power storage (amp hours), different charging rates and different longevity of the battery itself. That is where the manufacturer's fine print comes into play.

#### Voltage

There is a direct relation

between voltage and power in tools. 18v was for a long time the standard, considered the maximum practical weight with reasonable power, but not as powerful as a corded tool. Some 24v tools showed up claiming close to corded tool power, but they were heavy and did not take over the market. Lighter weight Lithium Ion batteries have permitted the explosion to Milwaukee's 28volt line -- with claims to be as good as a corded tool -- and then the DeWalt 36 volt line -- with claims to be more powerful than a corded tool. Both of these batteries are close to the same weight as the old 18volt NiCad units if not lighter. As 18 volt Lithium Ion batteries start showing up we will find the old standard 18 volt power in a lighter package responding once again to the ever present demand for lighter tools.

Amp hours (Ah) This is kind of like the size of the gas tank -- how long will the tool go on a charge. Amp Hours doesn't change the power, but it changes the amount of work you can get between charges. A higher amp hour basically means you have more battery in the same size package. Some manufacturers are bragging about their battery's amp-hours while others don't even list this on their spec sheets, maybe because they don't have anything to brag about. Milwaukee's "fuel gauge" is an interesting extra, letting you know how much charge is left before climbing the ladder.

Cooling Battery heat is a serious problem with powerful rapid charge and discharge batteries like those in power tools. Several years ago some companies started putting thermometers into the battery packs so that the smart chargers would refuse to charge until the battery cooled down or warmed up to room temperature. That helped to lengthen the life of batteries. As we get more and more power into smaller and smaller packages the batteries in the centre of the battery pack can age faster than the others because of heat. Bosch advanced the idea of inserting cooling rods between batteries to keep the centre of the battery pack from overheating, increasing the lifetime of their "Blue Core" battery pack by 50% they say.

Battery Chips Temperature sensors are not the only things manufacturers are putting inside the battery packs. Some time ago, DeWalt for one, put monitoring chips inside select battery packs sent out to be tested on real job sites. When they got the tools back, they had specific data on how often the tool was used, for how long and how hard it had been worked. This kind of information was used to help design new batteries. Milwaukee wanted to get a marketing edge on durability by giving a 2 year/1000 charge guarantee -- free battery if it fails and another 3 years/1000 charges on a pro rata warrantee. To do that they needed to know when the battery was first used and how many times it was charged -- hence their Smart Battery chip that keeps track of your warranty information for you.

Dollars It is interesting to see that weight, power and stored charge have become more important than price for many tool users. But not all manufacturers have put price last. Ryobi went in the opposite direction, marketing everything separately and bringing the 18v NiCad battery price down to \$30. Remember, there are so many variables in batteries today that shopping by voltage and price alone will not tell you much about what you are buying, and there are times when a light duty tool is more suited to the job than a heavy duty one.

Chargers If you are still using chargers from the first cordless tool you ever bought, it is time to update the chargers. Modern chargers analyze the battery and give it just what it needs -- no overcharging, no undercharging, no hot charging, no cold charging. They make all batteries perform better and last longer. Some companies are beginning to bring out chargers that will charge more than one level of voltage, but of course only their own brands.

Backward compatible? Will the new Lithium Ion battery work on that old NiCad drill? Milwaukee says yes; DeWalt says no; others say wait a few weeks. Bosch's new NiCad Blue Core works on their old NiCad tools too. Like it or not, since one company has done it and another is coming down the line, they will all eventually have to design in retrofit capability. But just like Beta video died and the movie studios have officially quit making VHS copies of films, someday you may have to throw out a perfectly good tool just because there are no more batteries for it. I still find replacement brushes for my very old corded drills.

So what is available in 18 volt and higher? Remember that charging rates and how many charges a battery can take before it dies does not show up in the data below. In alphabetical order and as of Spring 2006, and I guess I should add -- in Canadian Dollars: Bosch 18v NiCad 2.0Ah for \$120 and 18v NiCad 2.4 Ah for \$140. Lithium Ion coming in a few months. DeWalt 36 volt Lithium Ion for \$199. 18 volt NiCad for \$129. Both the 18 and 36 volt batteries are 2.4 Ah although that is not listed on the batteries. No plans for 18 volt Lithium Ion - DeWalt says that people want increased power not reduced

weight.Hitachi 18 volt NiCad 1.2 Ah for \$100. 18 volt NiCad 1.4 Ah for \$125. 18 volt Nickel metal hydrate for \$175. 18v NMH 3.0 Ah for \$200. Lithium Ion 18 volt coming soon.Makita 18 volt NiCad 1.3 Ah for \$85. 18 volt 2 Ah for \$129. 18 volt Lithium Ion 3.0 Ah for \$150.Porter Cable 19.2 volt NiCad at \$145.Rigid 18 volt NiCad for \$50. 18 volt NiCad 2.5 Ah for about \$50 later this year. 24 volt Lithium Ion 3.0 Ah coming in the fall.Ryobi 18 volt NiCad for \$30 with an expanding array of smaller light duty tools like routers, staplers, caulking guns, nailers and the like.Milwaukee V28 volt Lithium Ion for \$270. V18 volt Lithium Ion coming soon for \$145. 18 volt NiCad 2.4 Ah for \$ 180.

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