



## Stop killing your battery!

One of the most common things people do is the worst thing ever

Tony Olson, August 2013

So, what causes a battery to wear out? Much like any human being, a battery's health starts to deteriorate immediately after it is made. The aging process is both chemical and mechanical in nature. All batteries are perishable. It is the rate of aging where you can have some impact. The temperature, the charge method, the depth of discharge, maintenance procedures and just plain time all play a role in the life of a battery.



If you know anything about Li-Ion batteries, you may think it's a no-brainer top choice for most battery powered products that require a rechargeable battery. Well, hold on. Let's take a look at what happens when the real world hits the battery. Consider one of the most common usage models for a laptop computer: a desktop replacement. The Laptop is plugged into the AC outlet, with the battery fully charged. The laptop power profile in this mode is typically cranked to maximum performance. You don't need to worry about the battery draining, because it is plugged in. Sounds

great, right? Well, this is the absolute worst case scenario for Li-Ion life expectancy. The battery is basically sitting in storage with a full charge and at a very high temperature since the unit is running full-bore.

Some people recommend that you take out your battery and just run the laptop off AC power alone. But that is an over-kill response. It defeats the built-in UPS feature that laptops have with the battery installed. With the battery, the system can handle power glitches, brown-outs and even complete power outages without losing any work. Don't remove your battery. Instead, look below for useful tips on extending your battery life.

Getting back to the general case, batteries usually just don't up and die. They slowly lose health. This is demonstrated by their ever increasing inability to store and/or deliver a full amount of energy. But there are things you can do to help prolong battery life.

### Preserving battery life: Get the biggest bang for your buck

If you look at battery types, relative to the new emerging applications, current usage volume, and new research being conducted, you will see that Li-Ion batteries are the clear winner for portable electronic devices. Given this, let's look specifically at how you can maximize the life of your Li-Ion battery:

#### Do's and Don'ts on battery usage for a long life

- **Don't** leave your battery plugged into the charger forever. The worst condition for rapid aging of a Li-Ion battery is to keep it fully charged and at elevated temperatures. This is exactly "the laptop in a desktop mode" scenario.
- **Do** use your device regularly, on battery power only (not plugged in), and charge it before complete battery discharge. Like many other things in life, if you don't use it, you will lose it.
- **Do** shut off your device when not in use. This will lower the temperature of the battery and prolong its life (and you will waste less energy).

- **Don't** leave your device in a hot environment. (e.g. on the seat or dashboard of a hot car)
- **Don't** drain the battery fully between every single charging.
- **Do** allow (force) a full discharge approximately once a month on devices that use battery fuel gauges. This will force the fuel gauge to recalibrate itself and prevent premature cut-off from occurring.
- **Do** store the battery in a cool place at about 40% charge when it will not be in use for a while.
- **Don't** purchase spare Li-Ion batteries just to have around. The life clock is ticking.
- **Do** be very careful of static electricity around the battery pack and charger circuits. If the protection circuit becomes damaged, the battery could become dangerously unstable.

### Once your Li-Ion battery is worn out

- **Don't** try to shock it, or freeze it, or heat it back to life. There is no reviving it.
- **Don't** throw your old battery in the garbage or even worse, a fire.
- **Do** recycle your old battery.
- **Do** go get a new battery.

### Get a new battery, not ripped off (or worse)

- Look for a "born on date". There are numerous stories coming out now where people have purchased "brand new" replacement batteries, only to have them die in a few months. Remember, while that Li-Ion battery has been sitting on the shelf, in the warehouse, or on a slow boat from Asia, the life countdown timer is running.
- Buy a reputable brand and from a reputable retailer to ensure that the battery pack has the proper protection circuitry. Without it, a Li-Ion battery could explode. Some Internet only shops sell batteries where the specs have been cut to save cost. This is very risky.

In summary, Li-Ion rechargeable batteries pack a lot of energy in a small package. Proper battery care and maintenance will allow your rechargeable battery to provide you years of safe service. Finally, carefully consider where you buy batteries and ensure they are a reputable brand.

## Reality Check

After reading an earlier draft of this article, Rob (with PC Pitstop), in his usual cut right to the heart of the point manner said, “this is all great, but will any of this make a noticeable difference in real life? If it does, will it be significant to our readers?” Great question Rob!

At first we did research to see if someone had published data on battery life impact across these real world usage parameters. We found nothing. Next we thought about devising a test that D2 could run in our laboratory to determine the impact of these parameters on battery life. But that would take a lot of time and money.

Finally, we realized that we had a perfect real world empirical test right in our D2 offices. Emily, our Lead Behavioral Scientist and I had the same Gateway laptop with the same battery. Both of us used our laptops as our main work PC.

The key point for our purpose here however, was that we had very different usage styles. Emily used her laptop predominantly at her desk, plugged into AC power. Truly it was a desktop replacement model. She kept her system plugged in and turned on all day and night. At night, she put the system into suspend. Emily only turned the system off over the weekends. I on the other hand was constantly taking my system off AC power and running it on battery. I did turn the system off and on multiple times a day. I turned it off at night and it was not plugged into AC power.



The battery performance of our two systems was nearly identical for about the first three years. At that point Emily’s battery performance dropped off a cliff. Battery life for her went from about 2 hours for a full charge to about ½ an hour. She bought a replacement battery and was able to get another year before decreased performance on both the battery and the system moved us to get her a new system.



The battery in my system continued to work strong through the fourth year. Battery life for me stayed round 1 ½ to 2 hours on a full charge through this time. I was able to get a fifth year out of it, but I was really pushing things at that point In the end, I was only getting about 20 to 30 minutes on a full charge.

So what did our real-world example prove? Running the system cooler, with considerably less AC charging and regularly shutting-off the system allowed the battery to live significantly longer. Of course we have to say that your mileage may vary.

One last point to note, many companies rotate their IT equipment every three years. Had we done that there would have been no discernible difference. But if you are the type to want to squeeze a lot out of your equipment, treat your battery right and it will serve you well for longer.