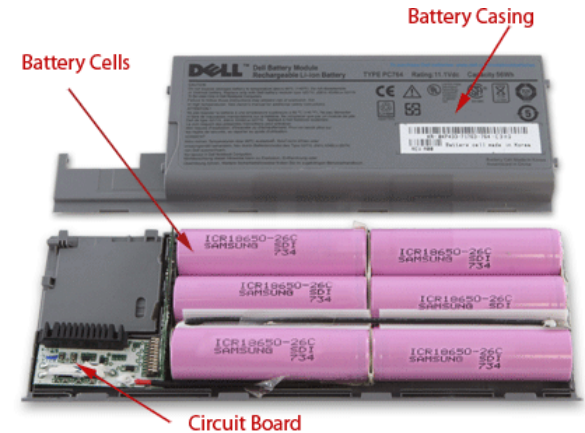


Hillingdon u3a Computer Club

Batteries - What you need to know

January 2025

Battery Design

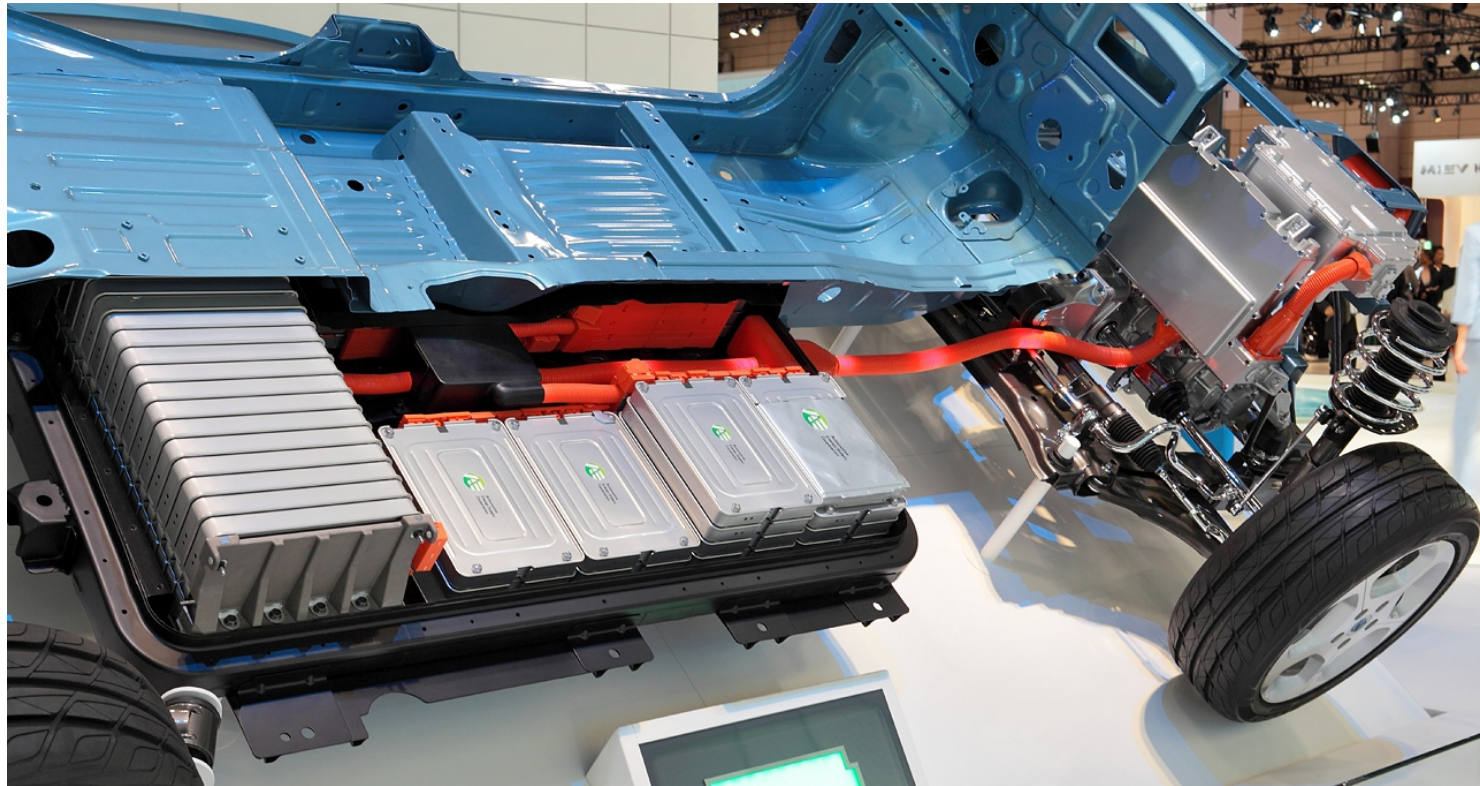


- A laptop battery pack is made from a number of battery cells depending on shape & power requirements

The Science

- Electricity needs flow of electrons and the cell in battery pack generates this through an electrochemical reaction. The flow starts at the Anode (the negative side) and goes in one direction to the Cathode (the positive side).
- A typical voltage generated for a laptop battery is between **11.1 V & 14.8 V**

Battery use Nissan Leaf Car



Battery Types

- The chemical cocktail in the battery was once made from ;
 - **NiCad (nickel-cadmium) or**
 - **NiMH (nickel-metal hydride)**
- NiCad **isn't** often used in laptops these days because it suffered unpleasantly from The Dreaded Memory Effect.
- A NiMH battery is longer lasting than a NiCad, but it too woefully suffers from The Dreaded Memory Effect.
- The memory effect is where the battery is not fully discharged before recharging. It caused crystals to form that inhibit a full charge. The battery seems to "**remember**" a lower level of charging.



Battery Types

- The most common chemical cocktail now is the **Lithium ion** battery type

The Li-ion battery are better as;

- They **don't** suffer with the Memory effect. Meaning they **don't** lose the capacity to fully charge if they **aren't** fully drained. Their discharge rate, at 10 percent per month which gives them a good storage life (but they must be used within two years of manufacture).
- However, they had some disadvantages.

Each battery pack must have a protection circuit that protects against overcharging, over-discharging, and too-high current. It also has a built-in safety vent. This is why Li-ion batteries come as a sealed unit with safety electronics. To help, each Li-ion battery provides a charge indicator.



Battery Ratings

A quick bit of electronics

How are Batteries Rated

- Batteries are typically rated on ;
- Voltage (V), milli-Amp hours (mAh), and Watt-hours (Wh).
- Wh and mAh are both measurements of battery capacity.
- When comparing two batteries, their Wh can be directly compared. The higher the number, the higher the capacity, meaning the battery will last longer on a full charge. This is because Wh is a unit that accounts for voltage, as seen in the following equation:

$$Wh = \frac{mAh * V}{1000}$$

Battery Care

How long do they last

- A laptop battery typically lasts between 2 to 5 years, depending on various factors.
- Most laptop batteries, specifically lithium-ion batteries, have a cycle life of around 300 to 500 charging cycles. A charging cycle refers to the period a battery is fully charged and then drained.
- Several factors can effect this;
 - Heavy use with gaming or video editing can shorten time between charges & strain the battery
 - Environmental conditions, extreme temperatures
 - Charging habits - constant charging or letting it drain completely will shorten life. Experts suggest maintaining 20% to 80% charge.



Battery Care

Some Good Habits

- On first use, fully charge and fully deplete it all the way.
- Charge the battery before it drops past 30% and disconnect it from the charger before **it's** fully charged.
- **It's** better to use a phone charger rather than connected to another device. Chargers have protection circuits built in especially for over charging & causing overheating - deadly for batteries.
- Chargers can also support fast charging & approved charges ensure the screen is switched off to avoid excessive heat damaging the battery.
- An always-on display (e.g. constant use) has less impact than you would have thought. Test show that always-on display consumed only 11% over 18 hrs

Battery Care

Some Good Habits - Laptops

- Some apps can hammer the battery. There is a Windows app called Battery Saver settings which has a link to see what apps are affecting battery life.
- Windows Task Manager now has Power usage and Power Usage Trends columns if you want a quick check.
- Apple has the same functionality in the Activity Monitor app under the Energy tab & Energy impact.
- There are some manufacturers apps that can help recalibrate the batteries capacity and warn in good time to recharge.
- Dark Mode can help, not enormously but especially on OLED screens that **don't** need to power the black pixels.
-

Battery Care

Some Good Habits - Laptops

Perhaps some obvious ones.....

- Dim the screen brightness when you can. If there is an automatic adjust feature then use it.
- Switch off WiFi and Bluetooth if you don't need them.
- Turn off the keyboard backlight
- Avoid using external peripherals
- Use headphones rather than speakers.



Battery Care

Some Good Habits - Smartphones

- WiFi calling is great if you have WiFi. Switch it on. If your phone detects a weak signal area it can spend energy seeking a new cell and then boost the power transmission to compensate.
- Streaming services can hammer your battery. Spotify, Apple Music, YouTube etc. Use their download facility to store a copy of the album or playlist before you leave the house. Stops the phone constantly using a 5G connection.
- Auto brightness setting on most phones does a decent job, but try switching the auto off and reducing it to 20 to 30%. Most of the time **you'll** not notice the difference and it can make a big difference to the battery.
- Dark mode again as most high end phones have AMOLED screens & **don't** use power for black pixels.



Battery Care

Some Good Habits - Smartphones

- Switch off Google Assistant if you **don't** use it. It **won't** make a big difference but as its always on, it uses power.
- Turn on WiFi Assist on Apple. It can boost battery by preventing the WiFi radios working overtime.
- Remove apps you barely use. They might ping or update using battery
- Remove the phone from its case on a fast charger. Stops the charger detecting heat and managing the charge to prevent the phone getting too hot and damaging the battery.
-



Battery Care

Some Good Habits - Smartphones

Perhaps some obvious ones.....

- Turn off the phones battery saving mode especially when nearing empty
- Close, **don't** just dismiss battery-hogging apps like the Camera app.
- Stop streaming audio/video if battery is running low
- **Don't** leave the phone in a hot place such as on top of a computer or close to a radiator
- Use WiFi instead of mobile data whenever possible.



Computer Batteries

The End

