# Lead acid battery explained

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A 12-volt motorcycle battery is made up of a plastic case containing six cells. Each cell is made up of a set of positive and negative plates immersed in a dilute sulfuric acid solution known as electrolyte, and each cell has a voltage of around 2.1 volts when fully charged. The six cells are connected together to produce a fully charged battery of about 12.6 volts.

The ions moving around in the electrolyte are what create the current flow, but as the cell becomes discharged, the number of ions in the electrolyte decreases and the area of active material available to accept them also decreases because it"s becoming coated with sulfate. Remember, the chemical reaction takes place in the pores on the active material that"s bonded to the plates.

Charging is a process that reverses the electrochemical reaction. It converts the electrical energy of the charger into chemical energy. Remember, a battery does not store electricity; it stores the chemical energy necessary to produce electricity.

A battery charger reverses the current flow, providing that the charger has a greater voltage than the battery. The charger creates an excess of electrons at the negative plates, and the positive hydrogen ions are attracted to them. The hydrogen reacts with the lead sulfate to form sulfuric acid and lead, and when most of the sulfate is gone, hydrogen rises from the negative plates. The oxygen in the water reacts with the lead sulfate on the positive plates to turn them once again into lead dioxide, and oxygen bubbles rise from the positive plates when the reaction is almost complete.

Deep discharging is another battery killer. Each time the battery is deeply discharged, some of the active material drops off of the plates and falls to the bottom of the battery case. Naturally, this leaves less of the stuff to conduct the chemical reaction. If enough of this material accumulates in the bottom of the case, it"ll short the plates together and kill the battery.

Undercharging is a condition that exists on many motorcycles. Your voltage regulator is set to maintain your system voltage at around 14 to 14.4 volts. If you"re one of those folks who rides the interstate highways with your voltmeter showing only 13.5 volts because you"re burning more lights than Macy"s Christmas display, you should be aware that that voltage is sufficient to maintain a charged battery but insufficient to fully recharge a depleted one.

Your alternator and a standard automotive taper charger have a lot in common; they seek to maintain a constant voltage. Here"s the problem with trying to quickly charge a deeply discharged battery with either one. Remember, we discussed how a heavy current draw would make a battery appear dead. Then, as the acid diffused through the cells, the concentration at the plates" surface would increase and cause the battery to spring back to life.

In similar fashion, the voltage of a battery during charge increases due to the acid concentration that occurs at the plates" surface. If the charge rate is significant, the voltage will rise rapidly. The taper charger or vehicle voltage regulator will taper the charge rate drastically as the voltage rises above 13.5, but is the battery state of charge commensurate with the voltage? No! Once again, it takes time for the acid to diffuse throughout the cells.

Although the voltage may be high, the electrolyte in the outer reaches of the cells is still weak, and the battery may be at a much lower state of charge than the voltage would indicate. Only after charging for an extended period at the reduced current will the full capacity be reached. This is the reason you must not judge a battery"s state of charge by measuring voltage while charging. Test it only after allowing the battery to sit for at least an hour. The voltage will reduce and stabilize as the acid diffuses throughout the cells.

Within the past several years, several companies have developed chargers that can charge a depleted battery quickly, and then hold the battery at a voltage that will neither cause it to gas nor allow it to self-discharge. These are sometimes referred to as "smart chargers" or multi-stage chargers. Here"s how they work.

So, I can just set it and forget it, right? Well, not exactly. For one thing, you need to monitor the battery occasionally for correct fluid level (unless you own a sealed battery). Another problem is that of exercising the battery. Even if held at 13 volts, the unwavering voltage will allow the battery to eventually begin to sulfate. With most of these units, I recommend that you unplug the charger at least once every 60 days during seasonal storage. Allow the battery to rest for a couple of days, and then plug the charger in again.

If you"re still reading this, you"re a real trooper. I realize that the subject can be confusing or even boring, but take heart; I went easy on you. There"s far more left untold than what appears here. This was "Battery"s Greatest Hits." I hope that it was enough to get you interested without sending you into information overload, and, maybe, now that you know how many ways there are to shorten a battery"s life, you know why no one can predict how long a battery will last. A lot of riders who believe they take excellent care of their batteries are actually killing them with kindness.