



Needled in the engine compartment, your battery serves the critical function of bringing everything to life.

Start Me Up!

INSIDE YOUR CAR BATTERY

Text by Don Ray / photography courtesy of the manufacturers

You might be wondering what Napoleon, soggy cardboard, and the city of Baghdad have to do with getting your car started in the morning... or not. Regardless, there is a connection because the history of the battery is rather longer than you might imagine. Batteries for automotive use are actually quite new and might never have come about were it not for the electric lamp.

Volcanoes found just outside of Baghdad suggests that one of the first uses for batteries was to electroplate objects with a thin layer of metal for decorative purposes. Researchers found electrical cells there, dating from around 250 B.C.

These were made from a jar (or with an asphalt stopper, sticking through the asphalt) was an iron rod surrounded by a copper cylinder. When filled with vinegar, the jar produced about 1.1 volts of electricity.

The idea may have been lost for centuries because it wasn't until 1800 that an Italian physicist, Alessandro Volta, built what he called an electric "pile." Quite literally, it was a pile of discs of different metals—zinc and copper—separated by cardboard that had been soaked in salt water. Volta continued his investigations into electricity, sufficiently impressing Napoleon, who made Volta a count.

Both of these examples are a common structure with almost every battery that has been built since, including the one you probably made in school using a lemon and two different strips of metal. The use of two different metals is key to the reaction that delivers the electricity in the first place. Still, you cannot have them touching, so you need something that allows the electricity to flow from one plate to another without creating a short circuit. That job falls to the vinegar, or lemon juice or some other liquid that is highly reactive. With those elements in place, you have a battery.

AUTO DEVELOPMENT

The first batteries in automotive use appeared around 1908 to power the electric horn. This innovation eliminated the need for a driver to shout "Get out of the way" while driving through a town. Bells had also been used as a warning signal, but these were easy to confuse with the presence of cattle. The automotive battery that we know today would have to wait for the invention of a workable starter motor by Charles Kettering of Dayton Electric Laboratories in 1911. His invention would be used in production by Cadillac in 1912 and his company would later become known as Delco.

Automotive batteries are typically made up of plates of lead and separate plates of lead oxide, which are submerged into a solution of sulfuric acid and water. This enables a chemical reaction that releases electrons, allowing them to flow to produce electricity. As the battery discharges, the acid reacts with the materials of the plates, changing their surface to lead sulfate. When the battery is recharged, the chemical reaction is reversed, and with the plates isolated, the process can be repeated. Each set of plates and their liquid makes up one "cell" of a battery and produces about 2.1 volts of electricity. Connecting six cells in series delivers 12.6 volts, which is what we use in today's cars.

You might think that a technology that



1 This cutaway view of a battery shows the placement of lead plates that serve to provide the charge within the fluid inside the battery.

2 Optima batteries use a "Spiracell"

Technology" and utilize glass-mat separators to avoid acid spilling.

3 The popular "Yellow Top" battery offers quality performance with premium

starting capabilities and deep cycle power. It's vibration resistant and comes with Optima's 12-month free replacement warranty.

has been around for almost one hundred years would be pretty foolproof by now, yet the AAA's Emergency Road Service statistics show that flat tires, battery problems, and lockouts together account for 50 percent of member calls for help. Battery issues are so common that their service trucks carry hot equipment and AAA-branded replacement batteries for an instant roadside fix.

LIFE SAVERS

To get a better grip on what you can do to prevent this kind of inconvenience and extend battery life, we spoke with Cam Douglass, product development director at Optima Batteries, a well-known replacement or upgrade product for enthusiasts. He told us there are three easy solutions to the most common mistakes: Never let your battery rest at a low voltage, do your alternator properly, and never deep cycle a starting battery.

According to Cam, "The first point is very relevant to our position, as many people own cars with significant electrical upgrades and the vehicles may not be

driven on a daily basis. Accessories such as alarms, electric fans, and audio systems create electrical loads that can be significant even with the key off. A battery that is slowly drained while it is sitting will start to sulfate. The speediest way to counter this is to use a good quality battery maintainer. Modern AGM (absorbed glass mat) batteries like Optima can maintain their voltage better during storage, but no battery can magically replenish itself as it is being drained."

On the second point, he mentioned "An automaker designs the electrical system to properly maintain all of your vehicle electrical loads and has a little extra to keep the battery charged. As soon as you start to add electrical accessories, you will be pushing or exceeding the limit of the alternator output. When this happens, the battery takes the load and provides the required energy. Many people don't realize the amperage it takes to run simple stuff like electric fans, hot pumps, water pumps and decent audio systems. Add up the amperage it takes to operate your car with all accessories

running, and then multiply this by 1.2 to 1.4 to get the alternator rating you need. Start with a baseline of 25 amps to keep your car with its stock accessories working and then add your accessories. Without a properly sized alternator, your battery will never receive a good charge and it will experience a shortened life."

On the last point, he explained, "Number three is using a 'starting' battery in an application where the battery is being deep cycled. Even though our Red Tops are very resilient to abuse, they are not designed for consistent deep discharges. Any energy requirements that are more or deeper than typical engine starting should have a battery capable of deep cycling. The eventual result of choosing a starting battery in a deep cycle application is short battery life."

TROUBLESHOOTING

Of course, the battery is only one part of the entire vehicle's electrical system. That dreaded, hollow clicking noise when you turn the ignition key to "Start" means the battery may have been drained. According