Battery Basics

In our recreational vehicle lifestyle we have a tendency to ignore our storage batteries, even though they serve an important part of the experience. They get placed in cramped storage areas and are forgotten until they do not respond appropriately when we call on them to use some of their stored energy. If we understand the battery processes more fully, we will be more attuned to their maintenance needs and will receive better service over a longer time. The author wishes to thank Larry Jones, WBCCI # 9805, for the column idea and T J Byers for the technical data.

Lead-Acid batteries are composed of multiple cells consisting of lead plates, suspended in a diluted sulfuric acid solution called electrolyte. Each cell produces a certain number of volts. In a typical 12-volt battery there are 6 cells connected in series, each producing 2 volts.

Battery energy is stored in a reversible electrochemical process to be released as needed. As voltage is used from a lead-acid battery, sulfuric ions are removed from the liquid sulfuric acid solution and embedded in the lead plates. As the battery reaches a discharged state, it requires charging to reverse the process and complete the cycle so the battery is ready for reuse.

Charging begins when you apply voltage across the plates of the cells. With "full rate" charging a fast chemical reaction changes the electrolyte and plates in the cells. Sulfate ions are removed from the plates and re-suspended in the sulfuric acid liquid solution. In time the energy absorbed by the battery saturates the process and equalization occurs as 70 - 80% of the charge has been replaced in the battery and the resting battery measures approximately 12.6 volts. If the battery charging continues at a fast pace, electrolysis occurs and the water in the sulfuric acid breaks down into its components of hydrogen and oxygen. This gassing (sometimes called boiling) occurs after equalization under continued full rate charging. If full-rate charging continues the battery will be permanently damaged.

Most automatic battery chargers are designed to sense equalization and reduce the charging current to keep electrolysis at safe levels. This reduced charging current, called the "finish current", slowly replaces the remaining 20 - 30% to bring the battery to a fully charged state, measuring approximately 13.2 volts at rest. The battery can then be disconnected from the electrical current and is ready for reuse.

Unfortunately batteries in a resting state lose up to 10% of their charge per month. To offset this they are usually left on a "trickle charge" to equalize input and natural loss. For a large cold cranking amps (CCA) battery the maximum full rate charge is 15 to 20 amps, the finish charge is 2 to 5 amps, and the trickle charge is 1 to 2 amps. Lesser amp batteries charge at a slower rate. To reduce complexity and increase reliability many automatic chargers combine the finish and trickle charge, allowing 2 amps to serve both purposes.

No smoking, sparks, or flames should be near charging batteries because of highly explosive hydrogen and oxygen that are byproducts of the charging process. Although most of us are aware of this caution and also know not to drop a wrench and cross the positive and negative poles, there is one associated safety tip that rarely gets mentioned. When dismounting a battery from its normal installation, always put the wrench on the negative bolt first and remove the terminal from the battery negative pole. Then remove the positive terminal. There was a "mechanic" who used a wrench to loosen the positive terminal first. While still touching the positive terminal, the back of the wrench grounded on a piece of the vehicle metal, producing a direct short. The resulting sparks ignited some hydrogen in one of the cells and blew a large crack in the side of the battery, necessitating a new battery. Had he followed the safety tip, this dangerous and costly mistake would not have been possible. Remount the battery in reverse order, i.e. reconnect positive first, then negative.

Occasionally you need to replace the battery water that is naturally lost to evaporation and gassing. Most batteries have two caps raised above the top surface of the battery each covering three cell-access holes. After removing the caps be aware that moisture on the cap covers or on your fingers is an acid that can eat holes in your clothing. Do not overfill the cells as the water level should be about 1&1/4" below the battery top surface. If you do not perform this maintenance, it exposes the top of the battery plates to air and they become oxidized. Upon subsequent refilling, the battery will never again reach 100% recharge.

Take care of your batteries and they will serve you faithfully. If you ignore your batteries you will soon be revolting.