

HOW A BATTERY WORKS

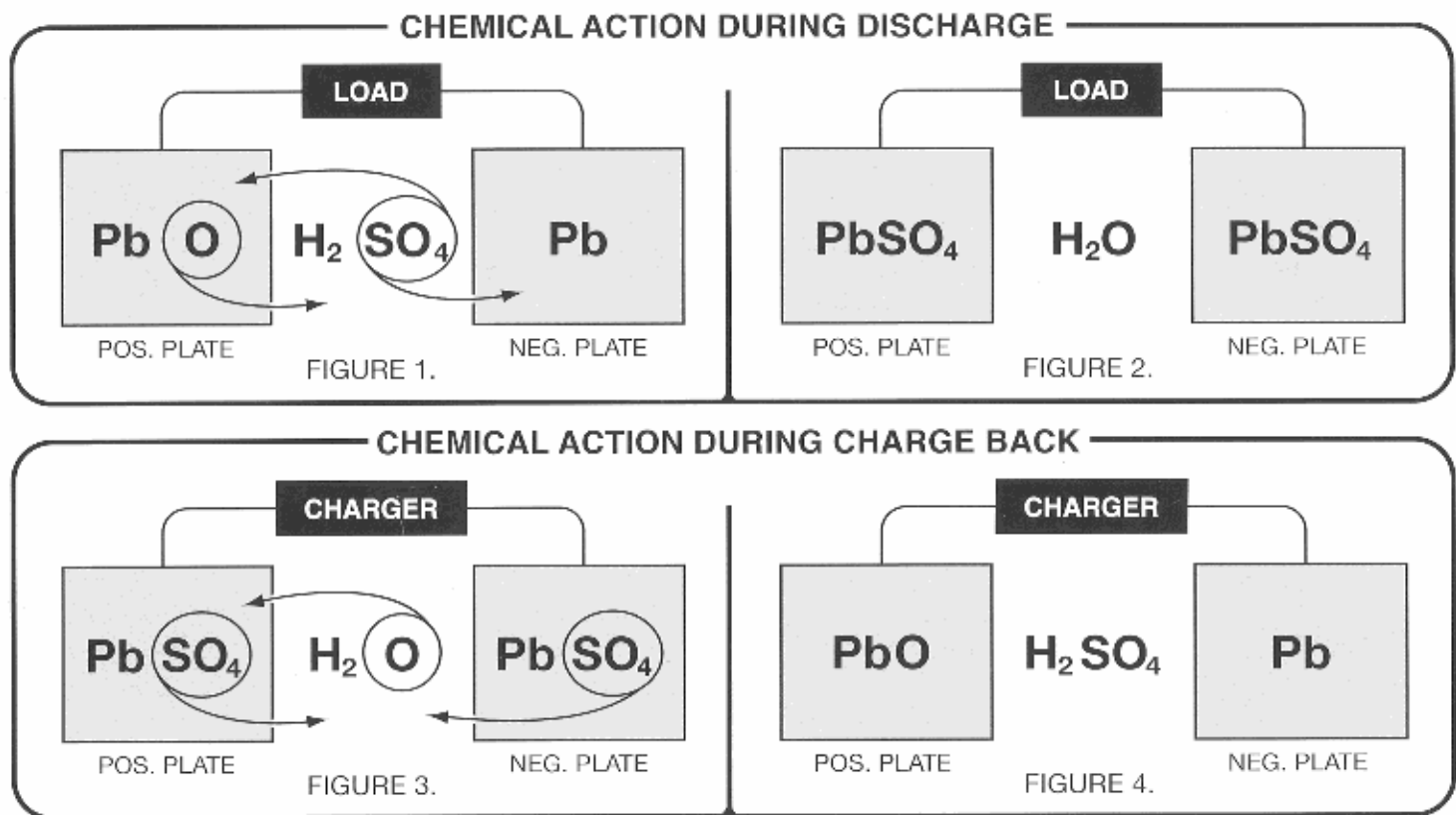
The Lead Acid Battery Consists of:

1. Positive Plate = PbO (chemically expressed)
2. Negative Plate = Pb (chemically expressed)
3. Sulfuric Acid = H_2SO_4 (chemically expressed)

These two plates (pos. & neg.) submerged in the sulfuric acid solution become an electrochemical system. When a demand for electrical power is made, a chemical reaction takes place within the battery's cell. FIGURE 1 shows the chemical reaction between the plates (pos. & neg.) and the sulfuric acid solution. The SO_4 (sulfate) from the acid solution moves inside the plates (pos. & neg.) and at the same time the oxygen moves into the acid solution.

FIGURE 2 shows what the battery's chemistry is at the end of discharge and the battery has no more power to give. The acid solution has been reduced to near water (H_2O) and the plates to lead sulfate (PbSO_4).

FIGURES 3 and 4 show the reverse of discharge when we place the battery on a charger and drive the sulfate (SO_4) back into the water (H_2O) to complete the charge back.



What is meant by "SPECIFIC GRAVITY?"

Specific gravity of battery electrolyte is the weight of the sulphuric acid-water mixture compared to an equal volume of water. Pure water has a specific gravity of 1.000 while normally, the optimum specific gravity of a new fully charged battery is 1.275-1.285.

Temperature affects the density of the solution, which of course, will change the specific gravity. It is therefore necessary to correct all specific gravity readings to a standard temperature (77°F or 25°C) to provide a common basis for comparison. When the temperature of the specific gravity reading is below 77°F , the temperature correction must be subtracted; whereas it is added, when the temperature of the specific gravity reading is over 77°F . A correction of .003 or "3 points" of specific gravity for every 10°F difference from the standard 77°F is commonly used. For example: a specific gravity reading of 1.286 made at 57°F would be equivalent to 1.280 at 77°F , while a reading of 1.274 at 97°F would also be equivalent to 1.280 at 77°F .

TRUCK COMPARTMENT:

The compartment should be large enough to permit reasonable access. Lack of clearance results in poor ventilation, accumulation of dirt, poor drainage and difficulty in changing. A compartment cover is important to keep out dirt (where the battery is not provided with a cover). The battery should be lifted only with a proper device. Make sure the lifting hooks are not so large that pressure is exerted on the connecting links of the battery. A spreader bar or device must be part of the unit so that in lifting, neither outward nor inward pressure is exerted. In other words, the width of the lifting device should be the same as the width of the battery at the lifting holes, so the lift is immediately upward.

INSTALLING BATTERY:

RECEIVING BATTERY: The battery case should be examined for rough handling and leaking electrolyte. If either is observed, mark the receiving slip accordingly and file a claim with the transportation company for any damage.

INSPECTION: After unpacking, inspect each cell for correct electrolyte level. The electrolyte level should be covering top of perforated shield, looking down into the cell.

WATER: Check water levels daily. It may be necessary to add water each week, or perhaps only monthly. The frequency will depend upon the type of battery, the workload or duty cycle, and proper charging methods. Add only approved or distilled water.

BATTERY MAINTENANCE WILL BE REDUCED IF WATER IS ADDED **ONLY** AFTER CHARGE IS COMPLETED.

SAFETY MEASURES: Keep open flames and sparks away from the battery, especially during charge, as gases given off are explosive. To avoid short circuits, do not lay metallic objects on top of the battery. Post a "No Smoking" sign in the charging room or charging area.

CLEANLINESS: Batteries should be kept clean and dry at all times. If the electrolyte is spilled, it should be neutralized with common washing soda and water (one pound of soda to one gallon of water). **Do not** allow the neutralizing solution to get inside the cells. When the acid has been neutralized, the battery should be washed off with water. Keep vent caps securely in place at all times, especially during charging and cleaning. Keep vent caps **clean**; check vent caps monthly to see if vents have become plugged. Rinse caps in warm water to clean — **do not** use solvents or soda.

CHARGING THE BATTERY *DO NOT REMOVE VENT CAPS DURING CHARGE*

FRESHENING CHARGE: It is advisable to give a freshening charge before putting the battery in service. Place the battery on charge and set timer dial for approximately 4 hours.

NORMAL CHARGE: Starting charge rates are usually 3 to 5 times the finishing rate, however, higher rates can be used as long as cell voltages do not exceed 2.37 volts per cell. At 2.37 volts per cell, the rate should be no more than 1 to 1½ times the finishing rate.

At the end of charge, the rate should be 1/2 the finishing rate or less.

If a normal days work does not reduce the specific gravity to below 1.230, it is advisable to use the battery another shift rather than recharge.

EQUALIZING CHARGE: About twice monthly continue the normal charge for 2 or 3 hours longer or until specific gravity and voltage stabilize over the same period.

TEMPERATURES

Particular attention should be given temperatures. If the battery operates continuously at high temperatures, **permanent damage will result**. During charging, it is desirable to open the cover to expose the top of the battery. When temperatures are continuously high, it helps to have an air stream from a fan across the open battery, (vents must be in place!). Efficient cooling results from the air striking the intercell connectors, not the side of the battery. Allow the battery to cool if temperature is 120° F *before* the charge.

KEEPING BATTERY RECORDS

Some type of records should be kept to get the best service out of your battery and truck. We suggest you select a pilot cell, take readings of specific gravity and temperature before and after charging, and record with the date. It is best to change the pilot cell occasionally to distribute any electrolyte loss over the battery in taking readings.