

BATTERY MAINTENANCE TIPS

1. CHARGING

a. Chargers

When charging vehicle batteries, follow the instructions provided by the manufacturer of the chargers you are using. Battery chargers on the market today are designed to bring a normally discharged battery back to full or near full charge in a given time period. The state of charge depends on the type of use and the miles traveled.

b. Hard Use

Where vehicles are used 'hard' each day, there is a good chance that the charger cannot keep up with the amount being discharged from the battery. In such a case, the batteries start falling into a low state of charge. The charger could be working perfectly; but if you do not get the vehicle on charge until about 10:00 PM and off at 6:00 AM, the chances are good that you did not get sufficient charge into the batteries to keep up with the amount discharged.

c. Catch Up Charge

It may be necessary at times to employ a catch up charge if your vehicle is used hard. On days when your vehicle is not in use, your batteries should be checked for state of charge. Any batteries that are not in a good state of Charge should be recharged.

Catch up Charge Recommendation

<u>Specific Gravity 72° F</u>	<u>Charge Required</u>
1.280- 1.310 specific gravity	None needed
1.260 – 1.280 specific gravity	4 hours
1.240 – 1.260 specific gravity	8 hours
Below 1.240 specific gravity	12 hours

d. Amount of Charge

To avoid getting batteries into a low state of charge condition, your vehicle should be put on charge early enough in the evening to allow for the full time schedule of the charger. On the other hand, do not charge batteries every day your vehicle is not used. By so doing, you will overcharge the batteries which will shorten the battery life. Overcharging batteries corrodes the positive grids resulting in the disintegration of the positive grid structure.

2. WATERING

The electrolyte in lead acid storage batteries is a solution of sulfuric acid and water. The sulfuric acid portion of this electrolyte does not evaporate, but the water portion must continually be replaced because of loss due to charging and evaporation.

a. Add Only Water

It should never be necessary during the normal life span of a battery to add sulfuric acid. If battery is tipped over, causing the loss of a quantity of the acid, then and only then should acid be added. This, however, must be done only by an experienced battery technician, after receiving authorization from the battery manufacturer.

b. Electrolyte Level

It is recommended that the electrolyte level be checked and water added when the batteries are near the end of charge or immediately after removal from charge. Be certain to replace the vent caps after watering so electrolyte does not splash out while the vehicle is being used.

Generally, water must be added to EV batteries about every 10 days of use. This, however, is governed greatly by the amount of charging and heat exposure. It is suggested that a few vent caps be removed at least every week to check and see if the batteries need water. The level of electrolyte should never be allowed to go below the top of the plates - this can cause permanent damage to the exposed portion of the plates.

Most EV batteries have an indicator ring inside the filling well showing the normal level for adding water. When adding water, fill slowly to reduce the chance of overfilling. The problem with overfilling is that while charging, acid is pumped out and lost, reducing the capacity of the battery. Corrosion of the posts and connectors will also be increased.

c. Type of Water

For the best battery life, only distilled water should be added. The reason for this is that some water contains minerals which will be harmful to the battery. Creek water or well water generally has a high impurity content and should not be used. Keep a log of the battery maintenance requirements.

RECOMMENDED ALLOWABLE
IMPURITIES IN WATER

<u>IMPURITY</u>	<u>CALCULATED AS</u>	<u>PARTS PER MILLION</u>
Color		Clear and white
Suspended Matter		Trace
Total Solids		100
Calcium and Magnesium Oxides	CaO & MgO	40
Iron	FE	5.0
Ammonia	NH ₄	8.0
Organic & Volatile Matter		50
Nitrates	NO ₃	10
Nitrates	NO ₂	5.0
Chloride	C ₁	5.0

*From Storage Batteries by George Wood Vinal.

3. CLEANING

The battery terminals should be tightened every month. If a coating of acid soaked dirt accumulates on the battery top, an electrical path will be created between the terminals. This, in turn, causes a leakage of current which reduces the operating efficiency and is detrimental to the life expectancy of the battery.

Washing

To prevent this from happening, the batteries should be washed with water after water has been added to the batteries. Make certain all vent caps are securely in place before washing the batteries to prevent significant amounts of dirt or foreign matter from getting into the battery cells. When batteries have an accumulation of white corrosion product that fails to wash off with a hose, the battery tops should be cleaned with a solution of water and bicarbonate of soda (approximately one cup per bucket of water). After scrubbing the battery tops with a stiff, non-metallic bristle brush, moistened with this solution wash off with water DO NOT USE A HOSE. Wash, rinse, and dry using paper towels.

4. TESTING

When the set of batteries is relatively new and the vehicle is not performing properly, first check to see if the batteries were fully charged. If the batteries were properly charged and trouble persists, the chances are good that there is only one battery of the set that needs to be replaced. Using a battery hydrometer and thermometer, test each battery individually, comparing the temperature corrected, specific gravity readings for each cell.

If the variation between the highest and lowest cell readings in any one battery is .050 (50 gravity points) or more, there is reason to suspect a weak or failing cell. This test must be accomplished with the batteries in a full state of charge and all cells equal in electrolyte level.

If after long use, individual batteries need to be replaced, it is recommended that the total battery pack be replaced in order to assure even operation of the power pack.

STORAGE

Self Discharge: Fully charge the batteries then store in an unheated area. Heat increases the amount of self discharge while cold reduces the stand loss characteristics of the storage battery. Physically sound, fully charged batteries, stored at 0°F self discharge very little over a four month period. On the other hand, if the same batteries were stored at 80°F, they would need to be recharged about once a month. Batteries in storage should be checked periodically; and when the gravity drops to 1.220 sp. gr. by hydrometer reading they should be brought back to full charge.

CAUTION:

The gases generated within a storage battery cell on charge, a combination of oxygen and hydrogen, may be ignited by an open flame or spark in the vicinity of the battery. The battery compartment must be adequately ventilated with a fan to prevent gas accumulation when charging.

DANGER: A match or other open flame should not be used to provide light for checking the level of electrolyte. Care should be exercised while working in the vicinity of the battery lest a short circuit produced by a tool could ignite the battery gases. Another possible danger is a spark produced by static electricity. The static charge should be eliminated by grounding the vehicle frame before working on the battery.

ALWAYS WEAR EYE PROTECTION WHEN WORKING NEAR BATTERIES

POISON/DANGER

Batteries contain sulfuric acid and can cause severe burns. Avoid contact with skin, eyes or clothing.

If battery acid is spilled, immediate action is required to check or eliminate its corrosive effects.

External: Flush with cold water.

Eyes: Flush with cold water for 15 minutes, then get medical attention immediately.

Internal: Drink large quantities of water or milk. Follow with milk of magnesia beaten egg or vegetable oil. Call physician immediately.

Car or Clothing: Should be washed immediately with cold water and the area neutralized with a baking soda or household ammonia solution. Bleaching or other damage can result.