Refurbish Any Lead Acid Battery

LEAD ACID BATTERY REPAIR

Thanks for purchasing this information.

A bit of my history: An investment group I was part of, purchased the remaining inventory of a Golf Car Company in 2001. We had nearly 2500 golf cars. Many were gas powered but most were electric. Even though some were brand new, they had been left for several years uncharged thus damaging the batteries. The cost of replacement was 3-4 hundred for each machine. This is why I began my quest for a solution that would be less costly. De-Sulfating is the goal. You can purchase electronic desulfators but they are expensive . There are chemicals like EDTA that will desulfate. (See links below). Another helpful remedy and the one I recommend here as it is least expensive and I have had extremely good results with is lowering the resistance by using Magnesium Sulfate. No matter how much I tried to change it to improve, the basic premise of de-sulfating and lowering resistance to aid in re-charge seemed to work best.

The battery that is found in your car, motorcycle, golf car, tractor & boat is called a Lead Acid Battery. They become wasted when they are left dead for even for a short period of time.
The maintenance of a lead acid battery is just the opposite of a NiCad battery because the technology is different. Lead acids do best when left with a full charge.

If you have ever went to start your Boat or Motorcycle in the spring you quickly find out that these types of batteries don't hold a charge for several months.
The reason for this is because the lead in the battery is exposed to uncharged raw acid when the battery slowly discharges over time and looses its charge. The lead in the battery simply rusts, thus blocking the flow of electricity and ability to charge properly.

To breathe new life into your lead acid battery you will need to first purchase the chemical Magnesium Sulfate. Which is EPSOM SALT and can be found at any Grocers.

THE PROCESS:
To recondition your lead acid battery you will need Epsom Salt, and a quart of distilled water.
Warm up the water to about 150 degrees (very hot but not boiling). The temperature doesn't need to be exact and will still work even if the water is at room temperature. Mix 16 heaping table spoons full of Epsom Salt into the water and stir until most is dissolved. Most batteries will be low on fluid so adding this solution will not over flow the battery. If not, remove enough electrolyte in the battery to allow this mixture to be added. Just below the plates is optimal. (approx 4 oz per cell). I have used a turkey baster to remove some liquid out of each cell equally. If they are totally dry , you may not be able to save the battery because the lead plates are most likely ruined.
Then simply pour this warm solution into your battery where you would normally put water to maintain the acid levels. Do not attempt to put Epsom Salt directly into your battery because it will not dissolve into the battery acid, only water will dissolve Epsom Salt.
After adding the solution it is recommended to put the caps back on. Place on charger for minimum of 14 hours. It will improve the performance after this first charge, however it takes about a week to fully remove sulfates and optimize the battery capacity. Each time you use and recharge the battery will get closer to original condition. Driving around will help agitate and remove sulfates.

If you take a battery Hydrometer reading before and after this procedure , you should see a noticeable improvement. This is the best way to measure results.

TIP: For Golf Cart charging I usually use a auto style charger rather than the cart charger. This allows individual battery charging (or 2 if you use in 12V mode and go across 2 batteries) You do not have to remove the interconnecting cables on the cart batteries. I do this because most modern automatic chargers will not turn on unless they sense the 36V charge to begin with , so if you have several bad cells or batteries the cart type charger may never turn on. This is not a requirement just a tip. (See dia very bottom of procedure.)

For a Golf Car, I also recommend changing the interconnect cables at some time. Most look very good from the outside but can be corroded internally. Can be checked with Ohm meter. They are about $18 on Ebay. I change mine every 2 years.

Some batteries have caps that come off the top to maintain the acid levels easily but Low Maintenance batteries require a bit more work to recondition. These batteries can still be reconditioned but you will have to look for the "shadow" marks on the top plastic that shows the holes into the cells. Simply drill holes in the plastic to get access to the cells then pour in your warm solution. You will then want to plug these holes with plastic hole caps that can be found at most hardware stores. It is also recommended to purchase a small solar charger to keep your unused batteries charged over the winter to prevent this problem from happening in the future. This method works most of the time but not all the time. It depends on how bad the cells are decayed. If left dead for long periods the cell plates can rust and/or short out. These will not be helped by this procedure.

ALWAYS WEAR SAFETY GOGGLES AND GLOVES WHEN WORKING WITH ACIDS!

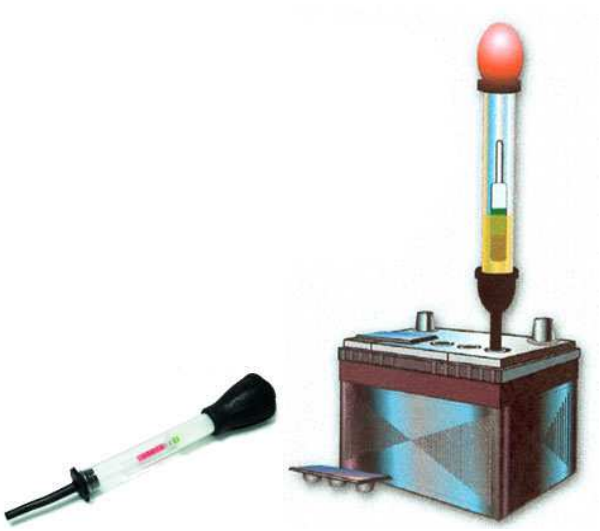
Links to information regarding De-Sulfation with EDTA
http://home.comcast.net/~ddenhardt201263/desulfator/hints.htm

http://www.webspawner.com/users/TRAILHEADSUPPLY/ **EDTA source**

Another Tip:
"Dissolving Sulfation with Distilled Water - Empty the electrolyte from each cell, and in its place put distilled water. Allow to stand for an hour or so, then put it on a slow charge of about 4 amps. The sulfate crystals will gradually dissolve (they are more soluble in pure water than acid/water) and turn into euphoric acid. A combination of battery charging and chemical reaction will cause a rise in temperature within the battery. If it reaches 45° - 50°C turn the charger off and let the battery cool down."
"Keep the slow charge going while the 'specific gravity' reading is increasing.
Some other formulas with ingredients a bit harder to come by but will enhance performance:

Power Additive No1 - Sodium Sulfate (salt cake) 15 parts, Magnesium Sulfate (Epsom Salts) 10 parts, and Magnesium Oxide (Calcined Magnesia) 5 parts. Mix all together (by stirring), then add 2 heaped teaspoonfuls to each battery cell. It may be necessary to repeat this treatment 4-6 months later.
Power Additive No2 - Aluminum Sulfate (also known as alum cake, papermakers alum and pearl alum) 88 parts, Magnesium Sulfate (Epsom Salts) 4 parts, and Cadmium Sulfate 1 part. Dissolve the Epsom Salts and cadmium sulfate in water. Then add the aluminum sulfate. Use only enough water to make a smooth concentrated solution. Use 3 teaspoonfuls every six months.

Battery Testing with Hydrometer



Battery Testing can be done in more than one way. The most popular is measurement of specific gravity and battery voltage. To measure specific gravity buy a temperature compensating hydrometer at an auto parts store. To measure voltage, use a digital D.C. Voltmeter.

You must first have the battery fully charged. The surface charge must be removed before testing. If the battery has been setting at least several hours (I prefer at least 12 hours) you may begin testing. To remove surface charge the battery must experience a load of 20 amps for 3 plus minutes. Turning on the headlights or place a load across terminals.

State of Charge	Specific Gravity	Voltage - 12V	Voltage - 6V
100%	**1.265**	**12.7**	**6.3**
75%	**1.225**	**12.4**	**6.2**
50%	**1.190**	**12.2**	**6.1**
25%	**1.155**	**12.0**	**6.0**
Discharged	**1.120**	**11.90**	**6.0**

*Sulfation of Batteries starts when specific gravity falls below 1.225 or voltage measures less than 12.4 (12v Battery) or 6.2 (6 volt battery). Sulfation hardens the battery plates reducing and eventually destroying the ability of the battery to generate Volts and Amps.

Please email me with any questions. I believe I have offered this information at a fair price and want it to work for you. I will give advice and answer questions as needed. Thanks Again and Good Luck. Hope this saves you money like it has for me. Rich

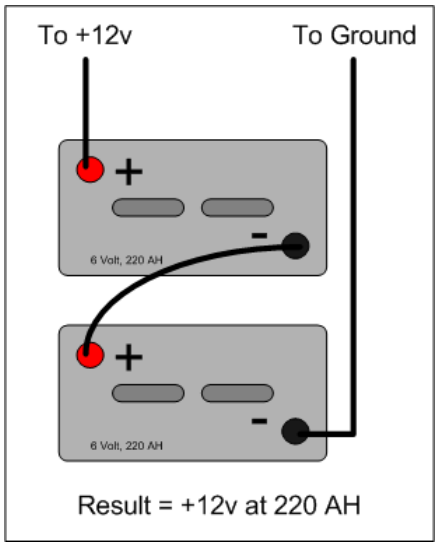
TIP FOR GOLF CART CHARGING

- ***I left my car unattended for a few months and now my charger would not come online. I have a newer model charger: Total Charger, Powerwise, Lestronic II, or Accu-Charge.***

Most modern golf cars have a kill switch or a "Tow/Maintenance" switch inside the battery compartment. If you did not flip this switch to the "TOW" or "OFF" position, the car's batteries will be drained at a rate of about 1 millivolt per day due to the controller's need for slight power. After a few weeks the batteries will become weak or dead. The newer electronic chargers must sense a certain amount of voltage in the batteries for the charger to come online. If the charger does not come on, the batteries are below the critical level of voltage the charger is trying to sense.

To remedy this problem, charge two adjacent batteries together in a series with a 12-volt auto-style charger. (SEE DIA BELOW) You will need to do this 3 times; once for each of the three sets of two batteries. Once the critical voltage level is reached, use the normal charger and charge as usual. For 8-volt batteries use a 10 minute charge per battery using a low amp 12-volt auto-style charger. Connect the leads before you turn on the charger and only charge each battery for 10 minutes max. Once the critical voltage is achieved, the normal charger will come on to charge.

This would be 12 volts across 2- 6 volt batt. You could hook up car type charger here



- ***How old are the batteries of my car?*** The battery codes will differ with the manufacturer, but only slightly. Below is the most commonly used date code system. The code will either be stamped into the battery posts or applied to the top of the battery with a sticker.

Battery Code Examples	
A=Jan	8=1998
B=Feb	9=1999
C=Mar	0=2000
D=Apr	1=2001

So a code of G1 would mean the battery was manufactured in July of 2001.