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## Basic Battery Care Information

### Watering Your Battery

There are two conditions in which watering can be harmful to your batteries. One is over watering and the other is under watering. It seems like most everyone does one or the other. In our recent meeting with the Trojan battery gurus, they told us that over watering is perhaps more harmful to the batteries than under watering, but they are both bad for the batteries. So we will talk about watering first.

### Over-Watering Your Batteries

The liquid (electrolyte) in a battery is a solution of water and hydrosulphuric acid mixed to a certain Specific Gravity (sp). During the normal process of charging and discharging the specific gravity of the electrolyte changes rather drastically. This is normal. It is also normal in the process of charging to lose some of the electrolyte due to gassing.

We'll explain how this happens in a moment. It is necessary periodically to bring the electrolyte up to the correct level by adding water and distilled water is **HIGHLY** recommended. Tap water that has been 'softened' should **NOT** be used. But adding water is where things can get screwed up. This is how it happens.

You come home from playing a round of golf and think, just before you recharge the batteries, "Gosh, I'd better check the batteries. I haven't put water in them for quite some time." So you open up the battery compartment and remove the caps guarding the cells and low and behold, the electrolyte level is low. So you get a jar or can and fill it with tap water and start pouring it into the cells. Oops, got too much in that one, it's overflowing. Oh well, not to worry. Wrong! Wrong! Wrong! You just made three mistakes, all bad for your batteries.

### **Mistake No. 1 - Do Not Fill Discharged Batteries**

In fully charged batteries the specific gravity of the electrolyte will be at its highest optimum level. As you discharge the batteries, the 'sp' of the electrolyte will decrease as a normal chemical process of the batteries. When you recharge the batteries, the 'sp' of the electrolyte returns to its optimum level. If you water a battery when it is discharged, you most likely will over water because the volume of the electrolyte will increase when you charge those batteries.

*Do not -- repeat -- do not water any discharged battery.*



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The correct way to water a battery is to fully charge it first, then check the level of the electrolyte and add water, if needed, to bring the electrolyte to the proper level. The only exception to this is if the tops of the plates are exposed. If so, then add just enough water to cover the plates, charge the batteries and then check the electrolyte and adjust to the correct level. Then charge for another hour to properly mix the new water with the existing electrolyte.

### ***Mistake No. 2 - Do Not Use Tap Water in Your Batteries***

OK, there are certain water supplies that contain absolutely pure water, but that is rare. In most cases tap water contains minerals that are harmful to your battery. Even if there are just trace minerals, over four or five years of battery life these contaminants can add up. The Trojan battery people sent us a long list of bad things common in tap water.

One of the worst is water that has been softened by commonly used water softener systems. Water softeners leave chlorides in the water and they are very bad for batteries. A new set of batteries for your golf car will cost you around \$900. Distilled water is inexpensive. So here is another rule: *Use Only Distilled Water in Your Batteries.*

### ***Mistake No. 3 - Do Not Fill Cells to Overflowing***

If you water discharged batteries to a point where they overflow when charged, or if you water to overflow fully charged batteries, you will deplete the electrolyte of the necessary mixture (specific gravity) of acid and water. In this condition the battery will not deliver its proper amount of energy. Furthermore it will put corrosive acid all over the tops of the batteries contaminating the cable ends, hold down brackets and battery racks. Now you better cleanup the mess or suffer the consequences. Do not assume that the acid will not hurt the aluminum battery racks of Club Car. Battery acid will eat away the aluminum as well as steel racks.

### ***Under Watering Batteries***

In our 27 years of golf car maintenance we find that under watering is the most common cause of battery damage. The dumbest statement we have heard about - comes from the maintenance supervisor of a large golf course. When asked who did the maintenance on his electric golf car fleet he replied, "Nobody. We don't have to do maintenance. These golf carts are leased." Most of the cars had little water in the batteries and they were failing right and left.

If the electrolyte level falls below the plates, the exposed portion of the plates cannot engage in the chemical process which creates the power of the battery. If the plates are exposed repeatedly or left dry for extended periods of time, that portion of the plates dies and cannot be revived. It is



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dead forever-exposure to oxygen has killed it. If a battery is left in a discharged state a process called chronic sulfation starts to occur. Sulfation happens every time you discharge your batteries but recharging reverses the process. Upon discharge a thin film of sulfate covers the active material on the plates. This film blocks the small sponge-like cavities that act as corridors for the electrolyte to move throughout the plates. When left, this thin film starts to build up and eventually it develops into a hard crystal that is difficult to break down. Over time the sulfation is irreversible and will cause the batteries to prematurely fail.

### **How Often Should You Water Your Batteries?**

The simple answer is, "Whenever it is needed." OK, OK when will it be needed? Well, that is the direct function of battery age and how often you use your batteries. The more often the battery is used, the more electrolytes are expelled in the process of what is called 'gassing'. We will talk about that a little later. The batteries will definitely not need water every time you use them, but a good rule of thumb and are to check them once a month. As batteries age they will need to be checked more frequently. In warmer climates the water will evaporate faster.

### **What Is Gassing in a Battery? Is Gassing Bad?**

No, gassing is good and a normal phenomenon in the process of recharging a battery. When you discharge a battery the sulfuric acid in the electrolyte is "consumed" by the active material on the plates. When the battery is recharged, the acid is liberated and returns to the electrolyte. But this acid is heavier than water and tends to drop to the bottom. At about 80 or 85 percent of the full charge nearly all of the acid has been returned to the electrolyte. The battery people say that the charging process is not completed because the electrolyte is 'stratified'. This essentially means that most of the acid is at the bottom and most of the water is at the top of the battery cell. That condition is not satisfactory for discharging the battery again. This is where 'gassing' comes in.

As the charging process continues the electrolyte begins to bubble or gas. This gassing, as it is called, is necessary to return the electrolyte to an even consistency. In the battery business it is called returning to the correct specific gravity or equalizing.

Now there is a small problem with gassing. The gas escapes from the battery and carries with it a small amount of the sulfuric acid. This acid can corrode the terminals, corrode the hold down brackets, corrode the battery frame holder and just about any other metal it touches, steel or aluminum. It is no major catastrophe unless you ignore it. We will talk about that under 'corrosion care'.



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### **What Is the Optimum Level of the Electrolyte?**

The diagram below shows the optimum level of the electrolyte in each cell when the battery is fully charged.

#### ***Want a no-brainer?***

Buy yourself a battery filler bottle. Put distilled water in the bottle then put the special filler spout down into each individual cell and press straight down. Water will not come out until you press down because the spout is spring loaded. When pressed, air comes in through half of the spout and water trickles out through the other half of the spout. When the water level reaches the spout it cuts off the air supply to the bottle thereby stopping the flow of water. The cell will automatically fill to the correct level and then cut off. These filler bottle only cost \$24. Buy one here.

### **Charging and Discharging Your Batteries**

#### ***When Should I Charge the Batteries?***

There are a lot of different opinions out there on this question, and we have read conflicting viewpoints. So when we met with the Trojan battery experts, we asked them this question. Their answer was to recharge the batteries every time you discharge them. That's simple enough.

#### ***How Far Down Should I Discharge My Batteries?***

If you need to, you can fully discharge the batteries to where they cannot move the golf car any longer, but it is definitely not good for the batteries to do it repeatedly or under a heavy load. You will shorten the overall life of the batteries. The battery experts say that 50 to 60 percent discharge of the battery is ideal. After 80% discharge the battery voltage starts to drop rapidly and that, oddly enough, causes a dramatic rise in amperage needed by the electrical system to keep functioning. High amps are detrimental to the motor and other electrical components. In modern electric golf cars that amount of discharge probably would not be reached in 18 holes of golf. A round of golf is somewhere around 4 or 5 miles, depending on the course. New batteries will go 2 or 3 rounds on a full charge. But again that would not be good for the batteries. It is a good idea to have a 'state of charge indicator' for your electric golf car. There are various styles with various costs. You can look at them here.



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## **Caring for Your Batteries**

### ***New Batteries***

If you have the new electric golf car or an older golf car with new batteries, you can start from scratch caring for your batteries. If you have a brand-new golf car, you will notice that the terminals of the battery may be covered with an anti-corrosion substance. If you have replaced your batteries, you probably will not have this anti-corrosion coverage. We offer a Battery Terminal Anti-corrosion Gel. It comes in a small plastic container with a small brush attached to the cap. There is plenty in the container to do all of your batteries. It will not wash off with water. The very best time to apply this gel, or any type of protectant, is when the batteries & terminals are new or just cleaned. This gel will not work well on dirty, nasty, corroded battery terminals.

All batteries gas when being fully charged. Acid is escaping into your battery compartment during this process. If your batteries are new and there is no corrosion, you can wash them down with a hose every day, every week, or once a month. But we recommend that you at least do it once a month. The key is, the more you use them, the more you need to clean them. Charge them correctly, clean them often and your batteries will 'purr' and give you many years of faithful service.

### ***Old Cars / Old Batteries***

Now if you have an old car with old batteries that have not been taken care of, you have your work cut out for you.

### ***Charge the Batteries***

Be sure your batteries are fully charged, then check the electrolyte level.  
Clean the Battery Posts & Cable Ends  
Disconnect the battery terminals from all batteries.

### ***Warning!***

Do not wear any jewelry such as rings or bracelets. A ring shorted to ground will badly burn you and ruin the jewelry. Your finger and the battery could both be trashed. A loose necklace can cause equal damage. Be careful with the tools you use. Do not let the tools touch any adjacent battery posts at the same time.





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### **Warning!**

Some of the modern 'Regen' electrical systems have a specific sequence of disconnect & reconnect steps. Consult your service manual or local dealership before disconnecting any battery cables. 'Regen' cars have an automatic electronic braking system and have a TOW/RUN switch located under the seat.

Check all the battery posts for corrosion. If they have a white powdery residue or a slimy white, blue or yellow goo, they are corroded. For electric cars use a battery acid neutralizer followed with a wire brush and anti-corrosion gel. For gas cars with banjo-style lead battery terminals clean each battery post and the inside each terminal with a sharp edge. Unless battery maintenance is performed regularly a thick crusty electrical barrier may develop that is hard to remove. It can stop your car cold! Take a flat screwdriver and scrape the side of the post and you will see the shiny difference. The posts should be shiny all the way around. We have a neat and inexpensive tool that can do this for you. See it here.

### **Clean the Battery Cable Ends**

Next you need to clean the inside of the battery terminals. These are the round 'banjo-style' fasteners at the end of the battery leads, similar to what is found on automobile batteries. They are most commonly found on gas cars. Use the same method as above to make the inside of the lead terminal bright and shiny. If the battery cables are frayed or partially broken, replace them. If the cable ends are badly corroded, soak the ends in battery acid neutralizer until all corrosion is gone. Another caution is that jostling the batteries can cause active plate material to slough off, fall to the bottom of the cell, which reduces battery life. Keep the hold down brackets in good repair.

Check the Battery Holder Frame and Hold down Brackets If you have the batteries disconnected, lift one out and inspect the condition of the battery rack that holds it. If the rack is rusted or corroded, it must be cleaned and maybe replaced if the rust or corrosion is too severe. It would also be a good idea to paint the frame with a rust preventative once they are properly cleaned. If the battery holds down brackets are in bad shape, they should be replaced.

Clean the Entire Area with Battery Neutralizer It is not a good idea to use baking soda to neutralize battery acid. The byproduct of baking soda and acid is environmentally unfriendly. Instead, spray all the areas with a good battery neutralizer and then wash everything down with a garden hose. You can get this neutralizer here.



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### **Anticorrosion Gel for All Connections**

Now that everything is nice and clean and properly reconnected and tight, apply the anticorrosion gel to all connections. This prevents oxygen from getting to these connections and starting the corrosion process all over again.

Mysterious 'Liquid' on top of Your Batteries Strangely enough we have found that not all batteries (even of the same type) are actually the same. You charge your batteries and one or more of them may leave a mysterious liquid on the battery tops. The liquid is not too mysterious, it is electrolyte from the battery, which may have gassed excessively or boiled out due to overfilling. What is mysterious is why some batteries do this and some do not. This liquid has acid in it and you cannot allow it to stay on the battery top. Wash it off! There is not much you can do about the problem except clean those batteries (as described above) every time you notice it. Be sure to check for it often.

In conclusion if you follow these steps you will maximize the life of your batteries.