

How to Extended Life or Rejuvenate a Sealed Gel-Cell Lead Battery Part 2

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Always wear protective glasses when working with batteries. Insert the tool into the gap between the cover disc and the battery housing at an angle and pry the top up. One by one remove all discs, followed by all of the rubberlike caps. It is not absolutely required, but it is good practice to keep them together, to help with the reassembly. Once all cells are open, use a thick pointless needle and fill a large syringe with distilled water. The syringe and a pointless needle combination is available for the refill of ink-jet printer cartridges. A thin plastic tubing can also be used instead of a metallic needle. For a seven Ampere hour battery, load the syringe with ten cubic centimeters (10 cc) of water and slowly and carefully inject 2 cc into each cell. Wait a little while and inspect each filler hole. It is best to push the needle down at an angle and not too deep, as a metal needle can short and damage the plates, and any type of needle can create conductive bridges in it's track. Repeat the injections to all cells until they are properly rehydrated. After each injection the water should promptly diffuse between the plates. Repeat this procedure until each cell received 10-12 cc of the distilled water. Do not overfill. It is best to underfill slightly. Pay attention, not to obstruct the inlet tube and allow the inside air to escape. Otherwise, the water will flush out some residual acid onto the top, and may cause burns on contact with the skin. If this happens wash the affected area immediately with plenty of water.



Picture 1. Cell vent assembly

If the battery was unmaintained for too long and became a "lost cause" before the filling procedure, then it may require more than the 10cc water per cells. A completely dried up seven AHr battery can take up to twenty cc of water. This

volume is entirely dependent of

the battery's physical construction. Once all water is successfully inside the cells, it is time to start the slow charging process. The sooner the better. Reassemble everything, put the caps on, and apply a tiny droplet of acetone onto the underside of the covers, before push them into place. Make sure there are gaps for the air to escape during charging. Once charging begins, the internal charge carriers will produce a thorough mixing of the electrolyte. As the water mixes with the residue of old electrolyte it begins to attack and dissolve lead sulphite from the plates. Refilled batteries can function almost like new for long times. How well they function would depend on how much nonreversible capacity loss they suffered due to dry up and sulphate damage. Under constant float charge conditions, sulphates which quickly kills discharged batteries, grows very slowly.



Picture 2. Adding water to cells.

The best indicator of battery health is its internal resistance. To determine the battery's internal

resistance, connect a lamp with a 60 Watt light bulb to the UPS, turn on the lamp, then disconnect the power cord from the wall outlet. Carefully note the length of time when the light goes out. Record the lamps wattage and the time the UPS was able to power it and repeat the test monthly or at least once every three months. When the uptime shortens to about half of it's original value, it's time to replenish the water in the cells. Some UPS has a load test button, use it often to avoid surprises in a power out. A lot better test would be to measure and record, the actual battery voltage under load, every minute for five minutes, across the battery terminals.

For battery capacitance reference - a typical home computer system can be powered up 10 - 15 minutes (the exact time is dependent on monitor type and size and the computer processor) by a fresh and fully functional 7 AHr battery. A 60 Watt light should burn about twice as long. The electrical power in a fully charged 7AHr battery is $7 \text{ A} \times 12 \text{ V} = 74 \text{ Watt Hours}$ not allowing for any losses. Even with losses, a 60 Watt light should be powered for a full hour, before the battery will be completely exhausted. The longer the UPS is able to supply power to the light the less capacity the battery has lost. It is best to conduct these emergency capacity experiments with a desktop lamp and NOT with the computer.

Lead acid batteries should never be allowed to sit idle, disconnected from the float charger. It is most important to recharge them as soon as possible after discharge. Always discharge the battery as little as possible, and restore full charge quickly, and as soon as practical. Once the sulphatization progresses, more and more of the active plate material becomes covered by sulphate crystals. These crystals are not soluble in water and they are electrically nonconductors. As more of the active plate area is lost to crystallization the battery's internal resistance becomes higher and higher. Although it is possible to rejuvenate badly destroyed batteries, it takes a lot of effort and it is a difficult process even with regular wet cells. Therefore it is most important and beneficial to prevent battery degradation.

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