

Service Bulletins & Tips

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Wet vs Sealed Batteries – A detailed explanation of the differences between charging "Wet" Batteries and charging "Sealed" Batteries.

Golf Industry Show – This year's show is in Atlanta, GA. Stop by and visit us in Booth #1750.

Previous Issues of Service Bulletins & Tips – All issues of the *Service Bulletins & Tips* Newsletter can be accessed at <http://www.lesterelectrical.com/news/archives.htm>

WET vs SEALED BATTERIES

Charging requirements of sealed batteries versus wet batteries

There are two types of popular deep-cycle lead acid batteries in use today: SEALED and WET. Sealed batteries have VERY different recharge characteristics in comparison to wet batteries.

If you have wet batteries and are considering replacing them with sealed batteries, you will need a battery charger that is specifically designed to charge sealed batteries. The use of a traditional battery charger designed for wet batteries will cause irreversible damage to sealed batteries.

Comparisons and Definitions of Wet and Sealed batteries

The primary advantage of a sealed battery is that it will not emit corrosive gasses during use or charging, unlike a wet battery, and will not spill acid if tipped. Sealed batteries are accepted onboard aircraft, private boats and cruise ships, and can be shipped without the hazardous material designation assigned to wet batteries.

A sealed battery will not have removable caps that allow you to replenish the electrolyte, hence the term 'sealed'. A wet battery has removable caps.

Sealed batteries have pressure activated relief valves that open only in the event of overheating due to an overcharge. The caps in wet batteries are always open and vented to the atmosphere.

Sealed batteries are a group of batteries of various designs that are known by a variety of acronyms; AGM, VRLA, gel, spiral-wound, etc. The one thing they all have in common is the presence of a pressure activated relief valve.

Are sealed batteries "better" than wet batteries? That depends. Each type of battery has specific advantages and disadvantages. Factors to consider when choosing a battery are its cost/benefit ratio, lifespan, performance, run time, vibration-resistance, and maintenance needs.

Sealed batteries are standard for the majority of wheelchair manufacturers, and are also growing in acceptance in floor-care machines due to the increasing expectations of no acid spills, minimal maintenance, and no corrosive gas emissions.

Wet batteries dominate the golf cart, utility vehicle, scissor lift, and material handling machine markets. Wet batteries generally have a more favorable cost/benefit ratio compared to sealed batteries, and although their maintenance needs are higher, they have

a history of proven performance and industry acceptability.

Technical Details and Charging Differences Between Wet and Sealed Batteries

What are the differences between battery chargers designed to charge wet batteries and those designed to charge sealed batteries?

1. A battery charger designed to charge wet batteries will reach a peak on-charge voltage of 2.5 to 2.6 volts per cell.
2. A battery charger designed to charge sealed batteries will reach a peak on-charge voltage of 2.38 volts or less per cell.
3. A battery charger designed to charge sealed batteries has the capability of reducing the current output before the critical point of "gassing" voltage of 2.3 to 2.35 volts per cell is reached.

For example, a 36 volt battery pack has 18 cells, each cell has 2 volts.

A charger designed for wet batteries may raise the total pack voltage to 18×2.6 volts = 46.8 volts.

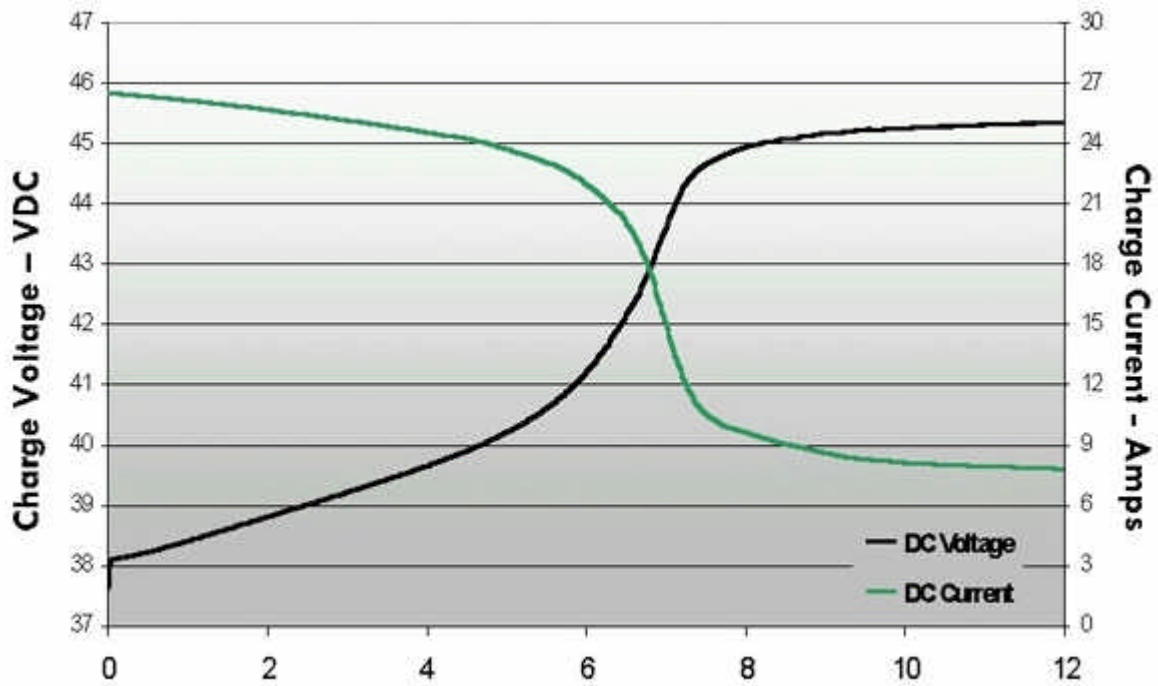
A charger for sealed batteries may raise the total pack voltage to 18×2.38 volts = 42.84 volts.

Although this difference of 4 volts may appear insignificant, it is enough overcharge to damage a sealed battery quickly. We have documented battery failure in 3 months when a wrong charger is used, or when the correct "dual-mode" charger is incorrectly set.

Sealed battery chargers have the ability to reduce DC current output before the gassing voltage of 2.3 to 2.35 volts/cell is reached when there is an increase in chemical activity within the battery and oxygen and hydrogen gas is emitted from the electrolyte. People with wet batteries quickly associate this point with the rotten egg smell of sulphur gas.

The current flow through a sealed battery must be reduced at this 2.3 volt/cell level to prevent overcharge and consequent overheating of the batteries. A charger designed for sealed batteries senses this voltage threshold and reduces the current output accordingly.

This graph illustrates the performance curve of a conventional ferroresonant charger designed for wet batteries.

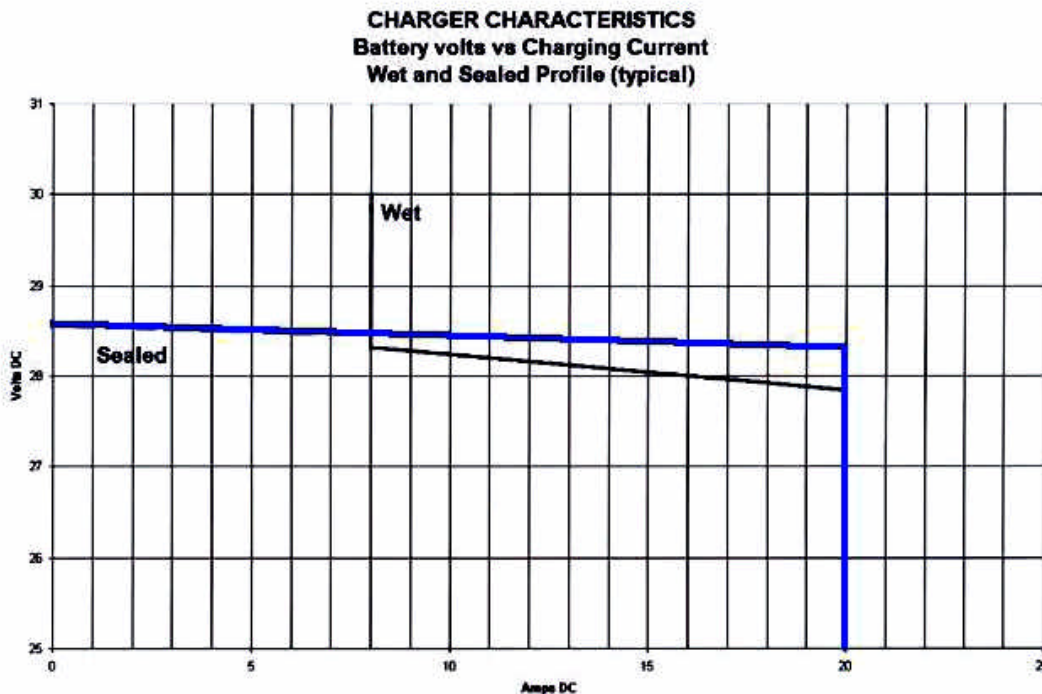


Typical 36V Ferroresonant Charge Curve

You'll note at the start of the charge cycle ("0" hours on the X-axis at the left) the initial start current is at its highest at 26 amps, while the battery voltage is at its lowest at 38 volts. As the charge cycle continues to the end the current output gradually decreases to a finish of 8 amps, while the battery voltage reaches a maximum of 45.4.

The current and voltage curves are near mirror-images to each other, they are inversely proportional. The current output is not regulated or controlled, and decreases in proportion to the voltage.

An SCR charger designed to charge sealed batteries produces a constant and regulated current output as seen in the blue line below. For a full-size picture of this graph, click on it and it will open the full size version in your web browser.



This charge cycle of this SCR (Silicon Controlled Rectifier) charger begins at the blue line at 20 amps DC on the X-axis. Note the abrupt reduction of output current at 28.2 volts (2.35 volts/cell). The charger will continue to output at reduced current until the maximum charge voltage of 28.6 volts is reached.

The graph above is representative of the output of one of our "dual-mode" SCR chargers. This one is our model 16370. Additional information for it can be read at this link:

http://www2.lesterelectrical.com/search/pdf/01400_G.PDF

This charger is capable of charging either wet or sealed batteries by moving a switch, or setting a jumper.

You'll note that the wet output assumes a flattened "Z" shape. This is to provide a finish charge rate of 8 amps that serves to equalize wet batteries which tolerate higher current inputs above the gassing voltage than sealed batteries.

One final note is that maximum charge voltage is only one of two measures the charger uses to determine when to turn off.

The other measure is a monitoring of the rate of voltage increase to determine if the batteries are indeed fully charged. When this rate of voltage increase slows to a crawl, so to speak, the batteries are charged. This can be seen at the right of the voltage plot in the ferroresonant charger graph as the slope of the curve approaches zero.

In short, the batteries are considered to be fully charged when the rate of voltage increase has decreased to less than .012 volts over a 30 minute interval.

Example: Your wet 36 volt pack measures 45.000 volts DC while charging. You measure again 30 minutes later and the voltage is now 45.013 volts. Should the charger continue to run?

Yes. The batteries accepted more than .012 volts of charge over our 30 minute reference interval.

A detailed explanation of this can be found in these links:

http://www.lesterelectrical.com/techservice/servicedocs/charger_runs_long.PDF

http://www.lesterelectrical.com/techservice/servicedocs/33367_b%20SCR_guide.PDF

Summary

Wet batteries are charged to a higher peak voltage than sealed batteries.

Sealed batteries need a charger that reduces current output near the gassing voltage.

Both wet and sealed batteries are considered to be fully charged when the peak voltage specific to each type of battery is reached, AND when the rate of voltage increase has fallen to less than .012 volts over a 30 minute interval.

2006 GOLF INDUSTRY SHOW

This year's Golf Industry Show this year is being held at the Georgia World Congress Center in Atlanta. Once again, Lester Electrical will occupy a booth at the show. We will have our 36/48V Discharger and our new SCR Charger on display, with literature about both. Stop by and see us at Booth #1750. We are located close to the "Environment And The Game" Pavilion, just off the main walkway. Below is a map of the area near our booth. For a detailed layout of the entire Golf Industry Show, please visit the GIS website at <http://www.golfindustryshow.com/> and click on the "Attendees" tab under the main heading.

