

AGM Batteries Versus Lithium Batteries

Deep Cycle Batteries are the key component in all renewable energy systems that require the storage of electricity. The battery is the storage vessel and as such, a critical component to any system.

There are three main types of lead-acid batteries and several types of lithium batteries that are commonly used in renewable energy systems, each with their own advantages and disadvantages. As far as lead-acid goes, flooded or “wet” batteries are the most cost efficient and the most widely used batteries in photovoltaic applications, but they require regular maintenance and need to be used in a vented location. Gell cell and Absorbed Glass Mat (AGM) type are considered “sealed” batteries, requiring virtually no maintenance and are therefore more suitable for remote applications where regular maintenance is difficult, or enclosed locations where venting is an issue. For Lithium, there are several chemical varieties such as Lithium Iron Phosphate (LFP or LiFePO₄), Lithium Nickel Manganese Cobalt Oxide (NMC), Lithium Cobalt Oxide (LCO), and Lithium Nickel Cobalt Aluminum Oxide (NCA) with the dividing factor being cobalt-based or non-cobalt based.

Windy Nation offers both Absorbed Glass Mat (AGM) and Lithium Iron Phosphate (LFP or LiFePO₄) batteries which are the most popular choice in RV and mobile applications due to superior safety and longer average lifespan, so we will be focusing on several differentiating factors between them, so you can make an educated decision when selecting the battery for your renewable energy system.



BattaMax AGM PN: BAT-RA12-100

BattaMax Lithium PN: BAT-LFP12-100

1. Physical Factors

Lithium batteries can store as much as four times the energy of a similar sized lead-acid battery, which means you can store the same amount of energy in a much smaller profile. As such, Lithium batteries are approximately one-third the weight of the AGM battery, so in applications where multiple batteries may be required and weight is critical, using Lithium can save a lot of carried weight, resulting in better engine performance and fuel economy.

The Windy Nation BattaMax AGM battery is approximately 63 pounds whereas the BattaMax Lithium is approximately 23 pounds, resulting in a 40-pound difference per battery. In larger RV's with four deep cycle batteries, this weight difference becomes significant. In addition to a lighter weight, the Lithium battery is also smaller, where the Windy Nation BattaMax AGM battery measures 13" x 6.8" x 8.7" and the BattaMax Lithium measures 10.2" x 6.6" x 8.2" (L x W x H), further freeing space where needed.

2. Maintenance & Safety

For most applications, safety is very important and when used in an RV, it is critical. AGM batteries are considered “maintenance-free” because they do not require the addition of water to offset hydrogen gas released during the charging process. The glass mat in the battery will absorb the hydrogen produced and keep it inside the battery. However, if the battery is inadvertently overcharged, the glass mat can no longer absorb any gasses, and the oxygen and hydrogen will escape through the valves.

Lithium batteries do not produce any gas and do not require ventilation, making them a better choice for space restricted compartments. Further, the BattaMax Lithium comes with an internal battery management system (BMS) that protects the cells from being overcharged or discharged.

3. Charge / Discharge Efficiency

One of the main factors leading to efficiency is the depth of discharge (DOD), which refers to how far down you can drain the batteries before recharging them. Most lead-acid batteries will experience a significantly reduced lifespan if they are discharged below 50% due to sulfate that will accumulate on the plates. On the other hand, Lithium batteries can be continuously discharged to 95-99% percent without any damage. With only 50% of continual capacity available with your AGM battery, an AGM battery bank will require additional batteries to equal the same continual capacity of Lithium.

With respect to charging, Lithium batteries can handle a higher charge amperage and can therefore be charged faster than AGM batteries. Further, for shorter or partial charge cycles, AGM batteries tend to lose their capability of holding a full charge. As an example, if an AGM battery is consistently charged to 80%, the battery may not be able to be charged above 80% over time. Lithium batteries are not affected by partial charges, and for systems, this can result in additional and shorter charge cycles under the same conditions using Lithium.

4. Lifespan & Cost

Lifespan or lifecycle generally refers to how many times a battery can be discharged and recharged while delivering 80% of the original charge. In short, Lithium batteries can last up to ten times longer than lead-acid batteries with roughly a 4000-cycle life at 95% discharge. Similarly, AGM batteries are only capable of 400 to 1,000 cycles, depending on many factors such as environment and depth of discharge.

Lithium batteries undoubtedly cost more than AGM batteries, and, in some instances, they can cost up to four times more than the AGM equivalent option. However, if you're actively using your batteries and charging them daily, you will go through lead-acid batteries much faster than lithium. If you factor in replacement costs associated with AGM batteries, lithium batteries often end up being more cost-effective in the long run.

Environmental conditions, i.e. temperature, will have an effect on battery lifecycle. AGM batteries have a wider temperature range and tend to perform better in extreme hot or cold conditions, making AGM batteries a better choice in these environments.

Finally, when considering usable capacity, you will need fewer lithium batteries to achieve the same discharge capacity.

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