

Some thoughts on Batteries

I am often asked about what batteries one shall choose. Especially of interest are the Gel and AGM-batteries that are being sold heavily by the battery manufacturers. Before you buy, maybe you could consider the following thoughts on battery types.

Gel-Batteries have the following main features:

- Possibility to charge batteries very quickly, e.g. a 100Ah battery in a small application (go-cart) can be charged with 100A and thus be full after just 30 min charging (with 50% discharged battery). Good for impatient children (no, we don't have such a go-cart). With our 560 Ah battery bank onboard Regina, however, we will not be able to charge with 560A, since I don't have a 560A Extra-Super-High-Output-Alternator. So no benefit for me here.
- Leakage proof, e.g. when the application capsizes (not the go-cart, please!) or for a small sailing boat. I will not capsize, I have decided, so not benefit here either.
- Explosion safe. This is good if you want to put a battery into a cramped area with bad ventilation. Certainly good for some sorts of boats, but not for a HR with good ventilated battery box. However, sealed batteries *can* extract explosive oxy-hydrogen gas, if being overcharged through their over pressure valve, so it could be a hazard to install even sealed AGM or Gel batteries in cramped area, should the charging cycle become incorrect. So no benefit for me here, either.
- No filling of water. This is good if the same boat is being used by many sailors, especially in hot climate and nobody is feeling responsible for checking the water level in the batteries. This would be the only draw-back for me, since I would not need to check and fill up water. I don't enjoy doing it, but it is OK.

What I do expect from a battery placed in that limited battery box is to obtain as many usable Ah as possible, preferably at low weight. This means:

1. Compact batteries
2. Deep cycle batteries, i.e. not damaging the batteries when emptying them down to very few percent of their capacity
3. Get them full to 100%

Now what are the real features of Gel-batteries:

- Gel batteries may NEVER be overcharged. This is difficult with a boat since sometimes you are charging under long engine hours,

sometimes with wind, sometimes with a towing generator or with solar cells. Imagine the batteries almost being full and you run the engine for a long time. The absorption time of the 3-stage regulator has a fixed voltage for a fixed number of hours and does not take into account the batteries state. You end up charging with - say 10A - for a looong time, clearly risking overcharging. So, if you have GEL or AGM batteries, you need to be very careful when charging for a long time to avoid overcharging. Thus, you need a safety margin when charging and your battery will seldom be 100% full (the slightest 100.1% and you are overcharging!)

- GEL batteries can practically NOT cycle more often than open batteries. Now that's new? Well, it is true that *theoretically* they can cycle many more times, but you will never be able to cycle an AGM or GEL battery to death. Instead, they die due to sulfate and AGM/GEL batteries have a higher tendency to get sulfate, since you can't check the specific weight and thus don't know when the GEL battery really is full. You can never "cook" a GEL/AGM battery (since you may not overcharge it), which is very good for open wet batteries to blend and decrease the risk of sulfate. "Cooking" means you on purpose do overcharge wet open batteries, so that the oxy-hydrogen gas being produced and move to the surface will stir (not shake) the liquid. Of course, you loose water by this, so you need to top it up regularly. With the "safety margin" of GEL/AGM, overcharging is not possible, stirring not possible and thus sulfate is becoming a bigger risk.
- If an AGM or GEL battery is totally empty, you will not be able to get it "live" again. You always need some electricity left to get it working. Maybe you never get so low, but at least important to know.
- With AGM batteries, the plates are very close to each other, which increases the risk of crystallising. This gives a short-cut between the plates and destroys the battery. Important is that this crystallising starts already at 12.3 V, thus long before you think the battery is "empty" and needs recharging. An AGM battery should thus never be emptied to more than 12.4 V! Not many know this!

So, with AGM you can't get a 100% full battery due to safety margin to avoid overcharging and you must be careful not to empty them too much avoiding crystallisation, so there really are not many Ah left in between for you to use!

So, the fact that you don't have to fill up water and that you don't need to see what's inside, does have a price!

To sum up: A GEL or AGM battery is a safe and convenient battery. No gas (when working normally). No filling. A good compromise for the sailor not interested in looking after his dear battery-babies and want to install them and forget them. They discharge somewhat slower, which means you don't have to charge them in the middle of the winter or more often, when you leave the boat in the tropics.

But AGM/GEL is NOT the ultimate solution and definitely not as good as the advertisement says.

If you choose between GEL and AGM, don't forget that the crystallising between the plates is a major problem with AGM, while less a problem with GEL. So GEL is better from that perspective.

Don't just listen to the sales men talking about total number or cycles, since there are other things that get broke before that (sulfate).

Think of the cost-benefit calculation, and you will find that there are no cheaper Ah than the wet open acid batteries. Then only disadvantage is the water filling issue as well as that you need a good ventilated battery box (such as in a HR).

In other words: we are still waiting for this wonderful battery hosting loads of Ah's in a small box to a reasonable price.

Having cruised extensively, I have added some more experience re draining our open Lead-Acid batteries under [Experience](#), which tells about some problems we have experienced with open wet batteries under heavy cycling.