- LI-ION BATTERIES VS AGM BATTERIES -

This Q&A file is a thread between Mar and Dean, two Selene owners discussing batteries issues… It analyses the benefits of Lithium-Ion batteries versus classic AGM.

◊ QUESTION

Hi, hope you've had a good Christmas and all the best for the New Year. We've been having, as usual, a great time on Northerly, just north of Sydney. I'm wondering if you might have any suggestions about the following… During this trip the two original house battery banks (12 each 2 volt) have given up. Frankly, been a surprise they've lasted so long, but there were a number of years with the previous owner where they were very little used. They weight in excess of 80 kg each and are spread around the boat. I was just wondering, given how much thought's gone into the boat systems in the original design, whether you'd considered some system for replacing them. Perhaps not, but I figured before starting the job that I should ask you. Any comment and advice much appreciated.
Mark

◊ ANSWER 1

Hi, I own a Selene 59/60 (hull #20) delivered in late 2008. My boat had the original Vision CL800 AGM batteries until last year about this time. Those batteries worked fine for me. In our style of cruising here, we tend to spend a lot of time at anchor and don't usually need air conditioning running (thus no generator running), so battery life is a pretty valuable commodity. My house batteries starting showing a very noticeable decrease in capacity in about the last year of their life. They were in the boat for about 8 years before we noticed a significant decline in their capacity.
I did quite a bit of research to decide between several options:

1. Replacing the batteries with the original Vision CL800 AGMs
2. Replacing the batteries with the mechanically (and electrically?) identical batteries manufactured for/by Rolls
3. Replacing the batteries with a more commonly available AGM
4. Replacing the batteries with Li-Ion batteries

In the end, we settled on option one. We were able to replace the entire house bank for about 6,000 US Dollars plus roughly another 5,500 for installation. I hired some local guys that have done this replacement work on several boats. They setup a series of ramps and platforms to move the batteries from the dock to the swim step and then down through the aft lazarette/stern door through the engine room and up into the master stateroom bilge. It was definitely not a job I wanted to attempt myself. I wish I'd been able to capture some photos of them doing it, but I wasn't there.

The Vision batteries had to be special ordered and took about 8 weeks to arrive. As you probably know, they are kind of an unusual configuration with four independent 2-volt Cells in each battery. Rolls also sells an identical battery and they did admit that their batteries are actually manufactured by Vision, but they insisted that their batteries have heavier plates than the standard Vision ones. I don't know if that's true or not. The price difference was very substantial--almost 2:1.

Most any battery setup other than the original CL800's or the equivalent Rolls batteries will require some re-work of the mounting scheme. I'm assuming yours are mounted the same way mine are, in the bilge of the master stateroom and the center stateroom. There are 24 batteries in my boat, with eight of them on the starboard side under the master bed, and 16 on the port side. The mounting scheme is actually quite well done, but not particularly easy to adapt to other battery configurations.

I was very pleased, even a little surprised, by how much improvement the new batteries made in the stability of the terminal voltage as the batteries discharge. One test (that I wouldn't recommend) happened within the first few months of the new batteries. My daughter and son-in-law were staying on our boat while it was at the dock plugged into shore power. Somehow, they accidentally tripped the shore power breaker on the dock, but didn't realize it because I keep all the 120V loads running on the inverters 100% of the time. Because they didn't realize it (and I didn't have my shore power monitoring system setup properly), they managed to run the house batteries down to under 20% charge (80% discharge). Even at that state of discharge, the terminal voltage of the batteries was still about about 23.5 volts, enough to

keep the inverters running quite happily! The terminal voltage was never that stable on the original batteries. It's possible that they weren't particularly well cared for during the construction process…

I've attached two graphs that I created using my Xantrex battery monitor system. These graphs show terminal voltage of the bank vs. the state of charge. You'll see the dramatic difference between the old bank and the new one. The terminal voltage on the new bank remains very flat well past the level I was willing to test them (then....shortly after this test, my daughter and son-in-law performed the "test" described above.) The life of these batteries is extended significantly by avoiding discharging them below 50%.

So… I may still consider a Lithium-Ion replacement when/if these batteries begin to show their age. Hopefully, by that time, prices will have come down significantly. If I get another 6 - 8 years out of this set of batteries, I'll be very pleased.

Dean can tell you a lot more about the costs and benefits of replacing the house bank with Lithium-Ion batteries.
Mark

◊ ANSWER 1

As Mark says, I can give you some guidance on going Lithium Ion for your batteries. The advantaged of Lithium Ion are the following:

1. High energy density: You can get a lot of Ampere-Hours in a fairly small space.
2. Lighter weight: I took over a ton of weight off of SaltHeart with the conversion.
3. High usable capacity: Discharges of 95% capacity instead of 50% as for lead-acid.
4. High cycle capability: A battery should have a lifetime of more than 5000 cycles.

Sounds good, right? However, there are some drawbacks:

1. They don't fit. The shape of the batteries is different than what you have.
2. They require modifications to chargers, regulators to keep voltages in spec.
3. They require battery management, or they can become dangerous.
4. They require occasional "conditioning" with a factory-supplied charger.
5. They are expensive (unless you value them by capacity-cycles.)

The bottom line is that making the switch to Lithium Ion is not for the faint of heart. I have no regrets, but I'm an Electrical Engineer and don't mind tinkering with these things. I have automated the battery management and I do watch it like a hawk. If the system goes out of spec while we're away the boat will page me and let me know. (It hasn't happened yet…)
Dean

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