Batteries -- How Much Do You Have In The Bank?

Batteries. We all need them. We all want more capacity. I mean, the whole idea of RVing is to take the luxuries and necessities of home on the road with us. Comfort is a GOOD thing. So is convenience.

Lithium Ion Latop Battery, Cooking

Batteries have been around a LONG time.The technology hasn't changed all that much in hundreds of years. A bit of lead, a bit of acid and behold, a battery. Yes, they've gotten marginally better in the intervening years, but there hasn't been a great leap in that technology for quite a while. We did have Ni-Cd's then NiMh, both had their advantages and disadvantages. (Anyone remember battery "memory?") Well, there is something relatively new afoot in the battery industry. Lithium Ion chemistry has taken most other types out of the mix when it comes to small electronics (cell phones, laptops, etc.) The problem is the basic Lithium Ion chemistry can go into something called "thermal runaway" it doesn't happen often, but when it does it can be catastrophic.

Imagine having that happen near you propane tank!

3.2V LiFeP03 Cell

There is a fix. A new chemistry. Still based on Lithium Ion technology, but MUCH more stable. Lithium Phosphate (LiFePO4). These have all the advantages of Lithium Ion technology, but won't meltdown like a bad nuclear reactor. (Two and Three Quarter Mile

Island, anyone?) The can store a lot more power than typical lead acid batteries, they weigh less, and can be discharged further than the typical 50 percent of lead acid without damage. They can be charged using existing technology and can be retrofitted pretty easily to any RV.

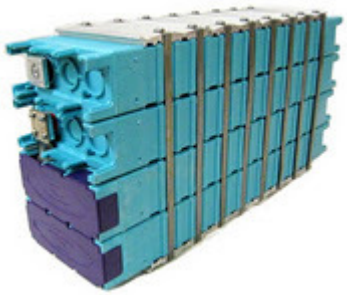
Sounds Great Right???!?

There Ain't No Such Thing As A Free Lunch. (*TANSTAAFL*)

They cost. They cost big. But wait! The prices are slowly coming down. A couple of years ago they were $3,000 (2009) now you can get a 200Amp/Hr setup for around $1,500. Now that electric vehicles are becoming more common place (let me tell you about my GM EV1 someday...) the batteries that drive (yes, pun intended) are dropping in price due to increased demand. With more factories expanding all the time it won't be too long before you can get these for $500/200Ah!

Typical Lead Acid Battery

Let's do some basic economics math. The typical RV has two lead acid batteries that provide around 200A hours total. You can discharge them safely to 50 percent so you have 100Ahrs to play with. They can usually be charged/discharged (a "cycle") around 500 times or so. The average cost for these are around $150, perhaps you have to have them shipped. They weigh around 80 pounds each so figure some money for that as well. If you take $150 times two batteries that's $300 and then divide it by 500 cycles you get about 60 cents a cycle.



4 cell 12.8V nominal LiFePO4 Pack

Now look at lithium phosphate batteries. Today, the cost of one 200Ah battery would be around $1500 but that's where we have to take another path. You can discharge these to 80 percent so from 200Ahrs you get 160Ahrs to play with. You can do this for 3000-5000 cycles! So if you look at the cost $1,500 divided by 3000 cycles = 50 cents a cycle! At 5,000 cycles it's only 30 cents a cycle! This does NOT take into consideration that you are getting 60 percent more amp hours per cycle to play with. If you figure that in, it's even less expensive since you could go with a smaller battery.

Did I mention they weigh 30 percent less that a lead acid battery!

Do you remember when I mentioned *TANSTAAFL*?

There are differing opinions on charging these beasties. Surely, a quality charge controller that can be programmed what the voltages should be at the various stages (Bulk, Absorb, Float) will work fine. The problem is that sometimes the cells themselves can vary in voltage and not charge fully. If you have four cells per battery pack, it's important to make sure each one is close to the other to make sure the battery lasts. They also do not like being overcharged (Who does?) and REALLY do not like being discharged below around 10.8 volts. Shouldn't be a problem as long as you monitor them and/or get a low voltage cut-off...I will be getting one and setting it at around 85 percent discharge. This way I can't destroy my expensive battery pack!

Typical Cell Mounted BMS

There are electronics that can manage all this for you. Available as a separate device or even pre-built into (onto?) your battery back. These will fix that problem right up at a bit of added cost. They are called Battery Management Systems (BMS) and can range from under $100 to multi-thousand sophisticated versions with LCD displays and lots of bells and whistles.

While I believe it is important to monitor your batteries (any kind) I believe the best monitoring software is in you own brain! Keep an eye on you voltages and you'll be OK. Check the individual cells once in a while and see if there any variance, If so, charge the low cell, or drain the high one :) I oversimplify, but these batteries are pretty robust.

Conclusions?

I'm not ready to make any set conclusion on a direct swap for lead acid at this time. I will be testing a 400Ah pack(s) in the coming weeks and will keep everyone posted on the results. It SEEMS like a great advance for RVers (What's not to love?) However, I'll be the guinea pig and experiment with them. Likely, something will fry, explode, melt down, or not be as advertised. Let the manufacturers put their product where there mouths are!

Various sizes of LiFePO4 cells

Stay Tuned to this space in the coming months for some real world testing data from yours truly. Everyone could use a bigger battery bank, couldn't they?

Be Seeing you, down the road.

Rich "*The Wanderman*"