The Volt Vette Project

Chapter 14

Going Batty Over Batteries

Batteries. The 900-pound gorilla swinging from a weak link! As soon as you think about electric cars, you start to think about what batteries you will use to power your little dream machine.

Here is a quick look at the different types of rechargeable batteries:

1. **Lead acid**
2. **Nickel-cadmium**
3. **Nickel hydride**
4. **Lithium-ion**
5. **Ultra Capacitor**

(Skip ahead if you already know batteries)

Boxes of acid with lead plates stuck in have been around for over 130 years.
I am having a hard time thinking of another mass produced invention that has remained so unchanged for such a long time.
On the upside, they are easy to find, come in many sizes and shapes, are easy to recycle, and are the least expensive.
On the downside, they are very heavy and pound for pound don't hold that much electricity. Also, they are temperature sensitive and deliver less power the colder they get.

Nickel-cadmium batteries have been around for over 30 years and have been widely used to power cordless tools. They are lighter than lead, more powerful, and can be recharged many more times than lead batteries before they die.

My cordless power tools use nickel-cadmium batteries. On the downside, they are very hard to find in the sizes needed to power an electric car, more expensive than lead, very toxic, and not as easy to recycle.

Nickel hydride batteries were invented to power electric cars. The patent rights were sold to GM who used these batteries to power their EV1 electric car. Nickel hydride batteries proved to be very dependable in real world driving. They gave the EV1 a 200-mile range and could last 100,000 miles. Unfortunately, the auto industry didn't like being told what kind of cars they had to make. Once the electric car mandate went away, GM stopped making the EV1. As of this posting, the nickel hydride patent is owned by an oil company. Very unfortunate!

Lithium-ion batteries are widely used to power laptop computers. They pack the most energy per pound, but are too expensive for most people.

The $100,000 Tesla electric sports car uses lithium and I will be watching to see how well they work and how long they last.

The most well known problem with lithium-ion batteries is that they sometimes catch on fire. This is a really big pain when you remember that lithium is one of the few things that can burn even when there is no oxygen!
If the cost and the burning problem can be solved, lithium could have a bright future.

All of the above battery types make electricity by way of a chemical reaction of one kind or other.
The ultra capacitor is very different. To over simplify, a common capacitor holds an electric charge between two, closely held, parallel metal plates. This is a cute trick, but there is a problem. Think of batteries as buckets of water. A lead bucket is much heavier than a nickel bucket, but you can slowly and carefully pour water from either one. But, when you pick up the capacitor bucket, it flips upside down and spills all the water it contains.

If you need a quick, tiny, shot of electricity you use a tiny cap. If you want a quick, big, shot of electricity you use a large capacitor.
Enter the ultra capacitor. In theory it pours like a chemical battery, but doesn't use chemicals to hold a charge, so it does not degrade and die. It can also recharge much faster than a chemical battery.
But, it is still in the development stage so you can't find it at your local store.

So I am forced to buy lead acid batteries.
There are two types, sealed and unsealed. Unsealed batteries leak acid, if tipped over. They also need to be watered regularly. But, they are cheap, and are forgiving if overcharged.
Sealed batteries are safer but cost about twice as much as unsealed batteries. They also can be damaged if overcharged.
I bought 13 Deka 9A31 batteries. They are sealed and weight about 70 pounds each.
To test each battery I hooked a 1000 watt inverter to it and a 300 watt light to the inverter. (see photo below, the inverter is at the bottom on the left) All the batteries passed the discharge, recharge test.

Next, a new driveshaft!