Getting Started with Marine Batteries

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Examining the engine room of an older boat prior to purchase, I noted with satisfaction a set of four massive 8D batteries. Plenty of power for starting and operating this boat, I thought to myself. And, in fact, from Seattle to Bristol Bay, the electrical system performed perfectly. But after the trip, when I began normal operation with shorter running times and longer periods on the hook, I began experiencing unpleasant symptoms: slow starting, sluggish pumps, static on the radios. Something was wrong, so I read up on batteries and electrical systems and discovered that those big black boxes of lead and acid were the wrong tools for the job.

The modern storage battery is a variation on an old theme: lead oxide positive plates and sponge lead negative plates are suspended in an electrolyte of sulfuric acid. As the battery discharges, lead from both the positive and negative plates combines with sulfate in the electrolyte to form lead sulfate, and oxygen combines with hydrogen from the electrolyte to make water. The specific gravity of the electrolyte decreases, potential between the two sets of plates decreases, and the battery loses its charge. During recharging the current flow is reversed, the lead sulfate breaks up into lead and sulfuric acid, the original composition of the plates is mostly restored, and the specific gravity of the electrolyte is increased. A little lead sulfate drops to the bottom of the case, and some hydrogen and oxygen are lost to the atmosphere; but in a practical sense, the battery is renewed.

All storage batteries, liquid cell or gel, work the same way, but the performance characteristics vary a great deal from one type of battery to another. We can divide marine batteries into two general types: starting, and "house" or "deep-cycle" batteries. Properly sized deep-cycle batteries will work for starting a diesel engine, but starting batteries (including those hulking 8Ds) do a poor job of supplying house power, and will die a premature death if deeply discharged more than a few times.

The difference is mainly in the plates. Engine starting requires massive amperages for only a few seconds, then the battery is immediately recharged by the engine's alternator. This means lots of plate surface area from many relatively thin plates.

A house battery bank supplies small amounts of current—usually two to 10 amps to power lights, pumps, and maybe a computer or coffee maker through an AC inverter. But it does so through the day and night, whether the engines are recharging it or not. Thin plates would soon be destroyed, so deep-cycle batteries contain fewer but thicker plates.

Battery capacities listed in "cold-cranking amps" or "marine cranking amps" indicate starting batteries. Where capacity is expressed in amp-hours, the battery is made to produce lower amperage over a longer period of time (20 hours is used for rating capacity). A boat should have a starting bank and a house bank, wired either through a three-way switch or through one of the "isolator" or "combiner" devices, which allows charging of both banks while preventing either bank from discharging into the other.

Sizing starting batteries is usually easy. Check the engine specs, or just look at what others are using for the same size of engine. House batteries are another matter, since the current demand varies with the equipment on each boat. Determine the amperage draw of each electrical device on the boat, then multiply hourly consumption by estimated operating hours per day, and add them up. This gives you your daily consumption in amp-hours.

Deep-cycle batteries should be good for 300 to 700 or more cycles, but they last longer if they are discharged no more than 50% of capacity. They recharge efficiently only to 85% to 90% of capacity. In combination, these facts mean that only 30% of their rated amp-hours are available on a sustainable basis, and less as they age. This means you need house battery capacity equal to at least three times your daily use.

This assumes adequate charging capacity on board. Alternator output typically is rated at 5,000 rpm, which may be faster than your unit actually turns, and output falls off at slower speed. If you do a lot of idling during the day, your alternator may be putting out little or no more juice than your electrical devices are consuming, and your batteries may not be getting recharged. In that case, to keep your batteries topped up, you need to use an auxiliary generator through a battery charger, a diesel-powered alternator, or a high-output alternator on your main engine. You can buy alternators as big as 300 amps but your batteries can accept a charge equal to only a fourth of their capacity, so a high-capacity alternator may be a waste of money.

Battery Tips

- Vent spaces containing liquid cell batteries to prevent buildup of explosive hydrogen and oxygen.
- Use bolted or strapped battery boxes of plastic or fiberglass to protect batteries, prevent slow voltage leaks, and guard against damage from acid leakage. Cover posts with caps to prevent accidental shorts.
- Check liquid cell batteries often, and top up with distilled water when necessary.
- Avoid excessive discharge, and prevent over- and under-charge by using a modern multi-step regulator and an electronic battery monitor. ✦