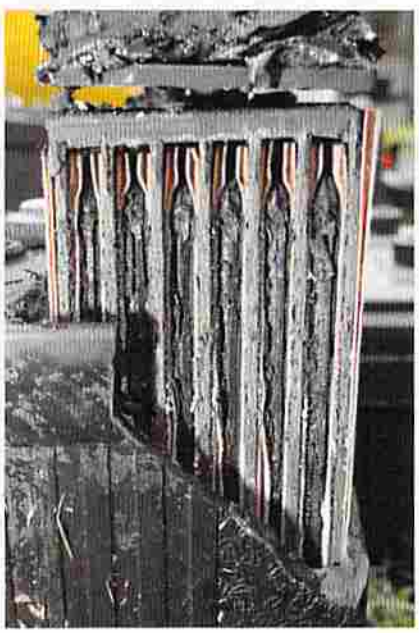
Sulfation Negation

If hard crystals have formed in the plates of your batteries, you've got problems. Here's how to address them. ***By Steve D'Antonio***

Recently I received a call from a client with a tale I'd heard before: Her cruising boat's relatively new house battery bank had lost its mojo. Strangely, she reported, the bank seemed to recharge very quickly after each discharge; but, frustratingly, its capacity was seriously diminished. Whereas it once carried all loads for 12 to 18 hours, it now struggled to keep up with demand for a fraction of that period, often requiring a recharge after just two or three hours.

If flooded, gel or AGM batteries are routinely discharged beyond 50 percent; and/or left in a state of deep discharge; or, in a worst-case scenario, left completely dead for an extended period of time, wherein they may suffer from a phenomenon known as sulfation, when hard crystals form in the battery's plates, each crystal diminishing the battery's capacity. (Note: The difference between a fully discharged and fully charged 12-volt battery is a mere 0.6 volts when measured at rest, i.e., with no charge or discharge for a minimum of six hours.) When sulfation occurs, it effectively shrinks the size of the battery bank.

The AGM battery bank in this example produced 700 amp-hours at 12 volts with several charging sources: a 130-amp inverter/charger, a small 30-amp backup charger and a 150-amp externally regulated alternator. The owner lives aboard and is away from the dock (and shore power) roughly 75 percent of the time, which means batteries are cycled daily during this period. So far, so good.



The disemboweled plates of this battery died a premature death from sulfation (left). Large house battery banks that are undercharged or that remain discharged for long periods often suffer loss of capacity through sulfation (top right). Some batteries can be salvaged through a process called equalization using a constant-volt and -current shop charger (bottom right).

No red flags appeared until she told me, almost in passing, that the boat had recently been in a yard for a bottom job, and during that time her shore power cord had been inadvertently unplugged while she was away from the vessel. When she returned, the voltage on the house bank was just 5 volts. Because the inverter would not come online with such low voltage (will your charger charge a completely dead battery?), she activated the backup charger, and the batteries recharged very quickly (almost too quickly, it seemed). The boat was launched and remained dockside for a week before she once again got underway, and that's when the low-reserve-capacity problem manifested itself.

I now had what I needed to connect the dots. (The rapid discharge and recharge, known as a surface charge, offered yet another clue.) When the batteries had been allowed to fully discharge (and remain discharged), they sulfated. The problem wasn't apparent while the vessel was dockside because the inverter/charger carried the house loads while the batteries acted as a mere buffer. Once the batteries were called upon to begin working again in their normal manner, they no longer had the capacity to do so.

The good news is these batteries were salvaged using a process known as equalization or conditioning, which is essentially an intentional, controlled overcharge that dissolves the sulfation crystals. Most inverter/chargers and some externally regulated alternators offer this feature; a shop charger adjustable for voltage and current could also be used.

But beware — not every battery type and brand is capable of being equalized. Manufacturers of most flooded (and some AGM) batteries offer instructions for equalization that must be followed scrupulously. Most gel batteries, however, are *not* capable of being equalized. And some manufacturers limit the number of equalization cycles that can be carried out over a battery's lifetime. So if you believe your bank is suffering from sulfation, and it's not well past its prime, it may be worth investigating equalization before you incur the hassle and expense of replacement.

Steve D'Antonio offers services for boat owners and buyers through Steve D'Antonio Marine Consulting (stevedmarineconsulting.com).

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