Tech Tips - The Corrosion You Never Knew You Had

By Bill Whitney

Face it. Your boat lives in a corrosive environment. Salt water, salt air, high humidity, dissimilar metals, hull sweat, leaks, you name it; they all contribute one way or another to the corrosion that inevitably finds its way onto your boat and mine. We all recognize it in its simplest forms like rust on steel, stainless steel and iron parts or the white power, known as intergranular exfoliation, on aluminum parts. Then we have the all too common green verdigris on our bronze hardware and the brown patina that paves the way for it. Because these forms of corrosion are readily recognized, and you can see it slowly eating up your precious boat, you usually attack it and try to eliminate it and its source or at least control it, which is really all you can do.

Unfortunately, there are many hidden areas on a boat where what we don't see we don't address on a routine basis. When was the last time you looked at the back of your electrical panel? Another common spot that is routinely forgotten is the big high current electrical connections on the batteries or, more importantly, the ground connection on the engine. If you service the batteries annually like you should, the idea of cleaning the connections has at least crossed your mind. But you may not have recognized what a little corrosion, or a poor contact between the battery post and cable can create if you didn't clean the mating surfaces.

Consider for a minute the amount of DC current it takes to start your engine. Depending on how cold it is and the size of your power plant, it could take up to 50 Amps or more from the battery to the starter motor to roll the engine over. Any dirt or corrosion between the connections creates a resistance to current flow. So if the connection at the battery, at the ground connection on the engine, or anywhere in between is corroded, less power is delivered to the starter motor. Think of this in terms of water flowing in a pipe.

Where: $$\text{Rate of water flow} = \frac{\text{Water pressure}}{\text{Size of The Pipe}}$$

Electrically this equates to: $$\text{Current} = \frac{\text{Voltage}}{\text{Resistance}}$$

The rate of electrical current flow is similar to the water flow. The water pressure equates to the battery's state of charge, with 13.8 Volts being a fully charged battery and the size of the pipe restricting the total amount of water flow through the pipe equates to resistance.

If, for example, you have a very small amount of resistance (.5 Ohms) in the circuit, the maximum amount of current delivered to the starter with a fully charged (13.8 VDC) battery would be:

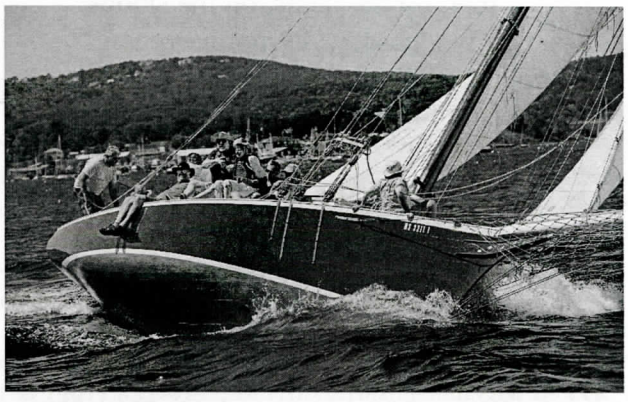
$$27.6 \text{ Amps} = \frac{13.8 \text{ Volts}}{.5 \text{ Ohms}}$$

So you can see that if you needed 50 Amps to get the engine spinning over fast enough to start, that half an Ohm (.5) of resistance isn't helping. And worse still, as the resistance goes up, the current available to the starter goes down even further.

In addition to having clean, corrosion-free connections on your batteries, it's important to have the correct size lug connections on the ends of your battery cables. Lugs come in many sizes. I can't tell you how many times I've seen boats where the battery and electrical cables were grossly mismatched. The typical marine or commercial battery has a 5/16-inch post. I have seen a boat owner use a 3/4-inch lug that was too big and floated loosely on the post. To get a better fit they sandwiched the lug with washers. This is not good practice! Matching the correct size and type of lug on the cable to the post will provide a much more secure and electrically superior connection to the battery.

To clean battery and other important connections, I use a rag moistened with a little kerosene or diesel fuel to remove any preservative or grease, then a red Scotch-Brite pad, fine sandpaper or a small wire brush. (Be careful not to remove too much of the soft copper or lead surfaces you are cleaning!) After cleaning and reconnecting the battery terminals, I highly recommend coating them with one of the several anti-corrosion products like CRC, Permatex or Gunk. These are available in spray cans at auto parts stores or your local chandlery, and provide good protection from battery acids and salt water, and help keep corrosion at bay.

The same principles apply to the other electrical connections on the boat, especially those that may occasionally draw a lot of current. Master battery switches, autopilots and master electrical panel switches are all candidates due to the environment in which they exist. It's common practice in the electrical power industry to routinely inspect and possibly shut down power panels to re-torque the nuts and bolts that hold the electric connections together. Admittedly, we aren't producing the high currents and voltages that commercial power plants are, but considering the more challenging marine environment our boats live in and the continuing movement and vibration found on boats, it's not a bad idea to do an annual corrosion inspection on the battery and other high current connections. Additionally I'd suggest that every five years or so a closer look at the other electrical connections may be in order.



***Tannis** #7, over hard in a fresh breeze in 2018 in Rockland, with no shortage of crew holding down the windward rail. (Bill Finch photo)*