Is electrolysis eating your boat?

By Nick Walker.

When we bought our steel boat 3 years ago, during the pre-purchase inspection, a few bubbles were detected in the antifouling on the rudder. At the time these were thought to be due to painting in unsuitable conditions. Subsequently we realised that they were the first indications of a problem known as electrolysis. I have since discovered the subject of electrolysis is complex.

What I'm talking about here is the damage caused by stray electrical current due to electrical problems on board the boat. There is another kind that is caused by dissimilar metals in a conductive solution (salt water) which is what your anodes are designed to take care of by being sacrificed instead of vital and costly components.

The damage from the stray current variety can be as simple as a small amount of blistering in the bottom paint to large amounts of metal disappearing from your propeller, prop shaft or hull itself, either over a long period of time or a short period of time. Stray current electrolysis can be thousands of times more destructive than the dissimilar metal type. It is possible for a vessel to be sunk by

stray current leakage in a matter of just days if the current flow is high enough.

Paint blistered off along weld lines and other random spots.

Metal boats, by their design can be more prone to it because the hull material itself is conductive and any stray wire or connections using the hull as a "ground" will result in electrolysis. But all hull

materials, including GRP or composite hulled boats will suffer too as they have metal parts below the waterline such as propellers, props shafts, through hull fittings, radio ground plates, etc.

My problem manifested itself by blistering the paint below the water line. When the blisters were removed the metal below them was bright and shiny, not rusty. This is because the electrolysis process caused the formation of a weak hydrochloric acid to form between the metal of the hull and the paint on it. This can be caused by having too many anodes fitted, which is what a couple of people suggested to me, so I reduced the number of anodes on my boat to no avail. I also noticed small amounts of my bronze propeller disappearing. I put up with this for 3 years, spending lots of time and money fixing the blistered paint each lift out only to have the same problem the following year.

This year, in a misguided attempt to fix the problem I attached a heavy cable between the engine block and the hull. All that achieved was to considerably accelerate the dissolving of my prop to the point where this year I needed to replace it.

So in the attempt to get to the bottom of this problem I spoke to a couple of marine electricians who both said “most likely a faulty electronic device or component” on board the boat. So, how do you find this fault? The accepted way is to use a meter with a special probe dangled in the water alongside your boat and one probe connected to your boat. Now, this can work but with a large number of devices and connections, even the wires themselves to be checked, the process could take quite some time. To pay for a

marine electrician to test, locate and fix the fault or faults (there can be more than one) can and most likely will be a costly exercise.

Paint blistered off around anode bolts, stern tube and P bracket

As a die-hard DIY person I started checking out options on the internet. After much reading I stumbled across a device called Seabis. This device connects to your boat, a wire to each battery terminal and one to “wet metal” meaning any metal part of the vessel that is normally submerged. It uses an inbuilt microprocessor to detect any current flow between your battery and your metal bits (hull, shafts etc) and give you an indication of how serious the problem is.

I won’t go into the process of removing faults here but what this device gives you is not only the ability to trace and rectify causes of destructive stray current, but also an ongoing safeguard against future problems by alerting you as soon as they arise.

With my boat I found 2 faults in the “house” wiring which were easily fixed and then turned my attention to the motor.

Now this is where nearly all boats will have problems. Most recreational marine engines will not be electrically isolated. That is, they use alternators, starter motors and pressure and temperature senders similar to those on cars and trucks. Even when not in use, the engine blocks are electrically connected to your batteries.

There are two ways of fixing this. The first is to change everything to an insulate, two-wired device but this is expensive and not practical for low use motors.

The other is to fit isolating switches between the batteries and the motor that can be used to totally electrically disconnect the motor from any source of voltage while not in use.

On nearly all boats, even when the battery switch is turned off, the negative terminal will still be connected to the motor. If you leave your battery turned on for running a fridge or light, etc, the positive terminal on your alternator will be live also. This is a very common scenario and a very common cause of stray current electrolysis.

The remaining time, when the motor is in use, typically less than 200 hrs per year for recreational vessels is so small that any potential damage will be miniscule.

This is quite a complex problem and I have learned much in the path to eliminating the problem from my boat but this device is a very worthwhile investment and I highly recommend it.

It has been invented and perfected by a retired electrical engineer from the Royal Navy submarine service, now residing in Australia.

For more details check out
www.seabis.com

The Seabis unit