LOVING YOUR BOAT TO DEATH.

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WAITEMATA WOODYS

Apart from fresh water ingress, electrochemical destruction of hull timbers is the biggest threat to our classic boat fleets.

The subject of cathodic protection of wooden boats over the last twenty years has certainly raised concerns with people due to the fact that many of their boats now suffer from Electrolytic Delignification or underwater wood rot. From here this concern breaks into two categories (clubs), the ones that do a little on-line study and are keen to talk to owners of boats who have like situations and have started to take action, the other group simply go by their gut feeling "*this is how it has always been done*" and ignore the very obvious tell-tales that their boat is suffering a terminal illness.

Amongst the hardcore classic boating community, the people who are true custodians are starting to understand the basic facts that create this problem. Much thought has been provoked primarily by the coal-face boatbuilding/repair workforce and supported by people who take a more academic/scientific view of this subject.

When talking to many of the older wooden boatbuilders about the subject of attaching anodes to a wooden boat, I have often had the reply "*why would you want to do that?*" In the days when these men did their trades, they were taught by their tutors or journeymen two simple facts: One—fit similar metals to the underwater parts of the boats they were building or repairing, Two— any type of electrical system must be above-ground (That means, totally insulated from any part of the boat).

The perfect situation, so why add an anode?

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Lady Eva about to be launched in the 1960s. Not an anode in sight.

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Some good examples of electrochemical destruction to timbers.

PHOTS THIS PAGE: WAITEMATA WOODYS

SO, WHEN DID THIS TROUBLE BEGIN?

The use of anodes on boats began in the 1950s in New Zealand. Many of our classic yachts had car engines fitted, electrical systems and electric bilge pumps installed. Many of these fixtures were not above-ground systems and due to this produced a network of electrical leakages through their damp, salt-laden timbers. The term used for this scenario—when the metal parts below the water line corrode aided by an introduced current—is called electrolytic corrosion. The other form of underwater corrosion is termed as galvanic corrosion and this is simply when two different types of metal wage a war between one another. This was very uncommon due to the fact that builders understood the above basic rule and used similar metals. However, fitting of anodes became fashion—the man behind the counter of the chandlery said "*they are a must*", on they went. One has to say "*the perfect consumer product*".

And to support this fact, older classic yachts that were built before and after the turn of the century, how come they did not have this problem until some had auxiliary motors and other electrical devices fitted?

THE SHOW BEGINS

So, along came the person who had a little bit of electrical knowledge or the electrical expert who knew his subject but gave no thought to the welfare of the wooden parts of the boat. He sees corrosion caused by electrical leakage and says to the owner, "*these must be protected*", on go the anodes. No thought was given by him to why this was happening and so he applied the "*band aid*" of fitting an anode or anodes. All went very well for a few years until the owner of the boat wondered why his boat had an unusual smell lingering and white stuff looking like candy floss around the through hull fittings in the proximity of the anode. The show goes on and the next step to prevent all of this was a practice known as bonding. To do this, all the main metal fastenings of the boat were connected via a loop and in most cases grounded to one common anode and sometimes to the negative side of the battery. In theory this practice sounded like the perfect answer as it balanced the electrical potentials (differences) of the metal materials. All of these metal fittings ran through moist salt-laden timbers creating yet more branches of current looking for home base. With both anoding and bonding the result was, and still is, electrochemical destruction of the timber around the so-called protected metals.

DON'T USE ANODES ON WOODEN BOATS—THEY MAY PROTECT THE METAL AT THE EXPENSE OF THE WOOD AND THE METAL IS FAR EASIER TO REPLACE THAN THE WOOD

The use of anodes and bonding on a wooden boat is fatal. The cathode or protected metal makes hydrogen gas and this combined with saltwater makes sodium hydroxide (Caustic Soda). This chemical is used to pulp wood in the paper-making industry. Not on my boat thank you! I say again, there is no reason to use anodes and bonding on any wooden boat. Steel hulls, however, do require anodes. If copper or bronze are being corroded it is due to a positive DC leak and zinc anodes will not help. Finding the electrical leak is the cure. If there is brass or manganese bronze underwater it will corrode due to the zinc in the alloy. Anodes will possibly stop the corrosion but at the expense of wood damage. A better plan is to replace the brass with proper marine bronze.

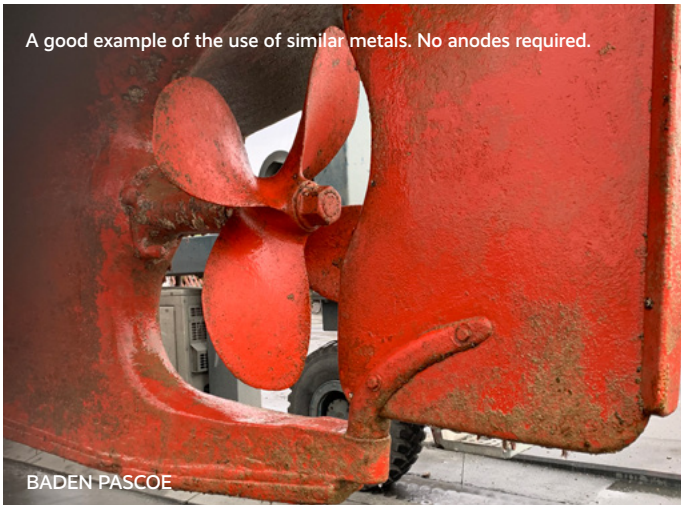
Bronze and copper should last indefinitely in the sea. To prove that statement, I ask you to look at the Roman coins and artefacts salvaged from old shipwrecks. There was no anodic protection and the metal is well preserved. So, what is the difference to the copper and bronze on your boat? There is absolutely no difference so why waste your money buying anodes that will in time destroy your wooden boat?

Three or four bottles of wine will cost the same as anodes and will make you and your boat happier."

(Quote: Chris McMullen via *Waitemata Woodys*)

BACK TO BASICS

In days when our classic yachts and launches were built most of the material used for underwater fittings was manganese bronze or gun metal, At the time when that material was produced, it contained arsenic and performed a lot better than the so-called same product of today with the same name. Manganese bronze is now produced with this important chemical removed. So, the end users who are aware of the pitfalls of this product now use aluminum bronze. Another issue however, is that most foundries do not like casting this metal because it does not run as well and does not machine as easily as the traditional metals of the same name. Again, products are compromised for commercial reasons with durability as a second thought. So, specify aluminum bronze if you want the good stuff and don't be seduced by just any shiny gold-looking metal.



A good example of the use of similar metals. No anodes required.

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INCREASE OF MARINE GROWTH?

Another issue caused by anoding is an increase in marine growth around the anodes and connected metals. The photos below show two launches moored in close proximity to each other.
(A) has anodes protecting all similar metals and was antifouled approximately 12 months before slipping.
(B) has again all similar metals and no anodes and was antifouled 24-28 months before slipping. It is not known if the anodes destroy the qualities of the paint or if various types of marine growth are attracted to the current they produce when working.

DO NOT FORGET THAT YOUR BOAT LIVES IN A VERY UNCOMPROMISING ENVIRONMENT

1. It floats in a brine.

2. It is made from a fragile organic material and fastened together with metallic materials.

It can easily become a battery with catastrophic consequences to its timbers if things get out of balance - an accident ready to happen.

WHERE TO START

The bilge of your boat is where you perform its health check. And do it often. We suggest at least every six months. Look for signs of powdering around fastenings and discoloration of timbers. And if you see anything odd ask yourself, "*why is this happening*"?

The following scenarios offer some ways to prevent damage to your boat timbers without going into the related simple science. They are proven examples of what owners have done, achieving major success in addressing their own issues.

A.

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B.

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SIMPLE ELECTROLYTIC CORROSION PREVENTION IDEAS

1. Fit good quality isolation switches to both negative and positive sides of all batteries or battery banks. This one simple action and discipline can eliminate issues even if they are not addressed as individual issues. Use them at all times when the boat is not in use.

2. Bilge pumps and float switches. All these items despite their brands have a limited life and once again live in a hostile environment. In many boats this single device is still left live while all other devices should be isolated (turned off when the boat is not in use). Some say these items represent up to 80% of electrical leakage. The other factor affecting their insulation is that the standard wiring on each item is too short and they are installed with poor quality connectors un-shielded lying in bilge water. All connectors need to be protected with glued heat shrink or if the wires are long enough connected as high as possible above the bilge.

3. Busbars and the like. Make sure they are insulated from any woodwork. There is a range of modern industrial plastics that can be used for mounting them.

4. Same goes for switch gear. However most modern switches are made of some sort of insulated plastic.

5. Contaminated starters, alternators and generators. These items need servicing and cleaning internally and can be a source of leakage.

6. The other thing to keep an eye on are marine engines based on multi-tasking motors—eg, automotive engines like most available today where any electrical components are earthed to the block rather than the items having a separate earth return.

7. If your boat leaks, stop the leaks and keep the bilge as dry as possible. Also make sure there is good air flow under the floor boards.

SIMPLE GALVANIC CORROSION PREVENTION IDEAS

1. If all underwater metal parts are of the same material—for example made from one of the marine bronze materials—no anodes are necessary. Some say, "*but I have a stainless steel drive or rudder shaft*". Then insulate the prop with Propspeed and the potential is not worth worrying about. Many wise wooden boatowners have adopted this concept and have had absolutely no further issues

2. Boats with steel shoes, rudder and other fittings: Remove them, or for new fixtures have them etched and epoxy-coated. At the same time do all steel nuts and fixing bolts. Once installed touch up with the same coating. Under water protect with the likes of Primacon. Once again insulate prop with Propspeed. In the case of some old boats with a full-length U section running under the keel do the same. No anodes required.

3. Same as above with copper keel cooling pipes. If the material in the cooling pipes is high grade copper or cupronickel no anodes required.

All of the recommendations require little or no understanding of the science behind the cause of damage done to wooden boats due to anoding or bonding and if you talk to owners of boats who have tried these simple remedies, they will endorse them.

In summing up, even if you do get slight deterioration of the metal parts of your boat over time, they are a lot easier to replace than the wooden parts.

GALVANIC PROTECTION FOR SHORE-POWERED SUPPLY

If you are connecting your boat to shore power (230v AC) then be aware that the shore-power earth will then be connected to your DC negative. This is an electrical safety requirement which has a possible unfortunate consequence for the galvanic situation on the vessel. This happens because DC negative will most likely be connected to an earth point on the boat and this point frequently has an electrical path to sea. If the boat has galvanic bonding wires fitted, then all metal parts in contact will now be connected to the shore power earth. Any other boats on the same marina similarly wired, will now be connected to your boat. If these boats have zinc anodes fitted then your boat will now have the same galvanic potential. So just when you thought you had done the right thing by NOT having zinc anodes fitted you now effectively have them courtesy of your marina neighbours! The current path is completed via the sea water.

Since destructive galvanic currents are DC in nature the solution is to ensure your shore-power earth is connected from an AC perspective but is isolated from DC. This is achieved by the use of a relatively low-cost device called a Galvanic Isolator which is installed in the AC ground wire. This will maintain the electrical safety aspect but block any DC current.

Also be aware that if you are just temporarily directly connecting a battery charger to shore power, ensure it is galvanically isolated, i.e. no connection between AC earth and DC negative output. Many automotive chargers do not have isolation whereas proper marine-grade chargers should.

For more detailed explanations on this subject visit these links.

https://waitematawoodys.com/2018/11/20/what-does-electrochemical-deterioration-in-a-wooden-boat-look-like/

https://waitematawoodys.com/2017/12/30/electro-chemical-damage-in-wooden-boats-update-revisited/

https://waitematawoodys.com/2017/03/28/the-most-referenced-viewed-story-on-waitematawoodys/

https://waitematawoodys.com/2016/11/08/want-to-see-what-in-a-wooden-boat-looks-like/

Disclaimer: *The recommendations in this article are for wooden boats only. Due to the fact that there are many variations when considering materials both wood and metallic, and a wide range of fixtures both mechanical and electrical, the authors take no responsibility for any outcomes.*