June 2024 Newsletter – There’s Bronze and there’s Bronze

Photo Essay: There’s Bronze and there’s Bronze

Bronze, an alloy made from copper and tin, has long been used for raw water components aboard recreational, commercial, and military small craft. It is generally strong and corrosion resistant, and can be expected to last indefinitely in a range of applications, from stuffing boxes and seacocks to struts and strainers. However, “bronze” can encompass a range of alloys, some of which are technically not bronze as they contain other metals, which also make them unsuitable for raw water use. Many bronze alloys contain zinc in varying amounts, which among other things improves machinability. Provided the zinc content is below 15%, it’s generally considered safe for raw water use. Copper alloys that contain more than single digit percentage points of zinc are in considered to be brass, and this includes “manganese bronze” (22%-28% zinc, along with about 3% manganese), and “Tobin bronze” (up to 39% zinc); in spite of using the word “bronze”, these alloys are not suitable for raw water use.

In other cases, bronze may be contaminated, or intentionally mixed, with other metals, which can either enhance, or degrade its performance. In the example shown here this “bronze” 90-degree plumbing elbow, used with a raw water strainer, is corroding, perforated, and leaking; based on the brownish hue of the accretion, the alloy from which it’s made may contain some iron. Regardless of its make-up, it must be replaced, preferably from a known manufacturer whose bronze components

are truly bronze, and which are designed for use in raw water applications.

Ask Steve

Hi Steve,

Questions: with the advent of lithium batteries on board trawlers are they safe? Safe enough to have onboard for an extended ocean crossing with all the banging around that the hull takes?

After watching and studying fires that involve lithium batteries that experience slight damage it scares the bejesus out of us. And, the BTU production threatening neighboring batteries could be a greater problem.

Lastly, if an engine room lithium battery fire does occur on board, will the automatic extinguishing systems be able to handle the BTU output of these batteries and their potential exposures?

Thank you ahead of time,

Paul and Marlene Vircsik

Dear Paul and Marlene:

You have posed questions, the answers to which could easily fill several feature-length articles. I will, however, attempt a broad response

Lithium ion (LI) battery house systems, of the Lithium-Iron-Phosphate (LFP) variety, are becoming increasingly popular. I am currently working on eight new build projects, all of which are destined to be equipped with LFP battery systems. It’s worth noting, there are several lithium chemistries, with LFP

being the most popular in the recreational marine market, and statistically among the safest (for now it's the only one I would recommend). If you compare the MSDS of an AGM battery to an LFP battery, the former seems far more ominous.

If you are contemplating a lithium upgrade, here are a few details to consider.

- Only purchase your battery system from a reputable manufacturer with an established track record in the marine industry. Ideally, you should obtain a "package" from them that includes batteries, battery management system, chargers and inverters.
- Make certain the battery system complies with ABYC E-13, and all related wiring complies with ABYC E-11.
- Make certain the installer is an ABYC Certified Electrician, and that he or she agrees to comply with E-13 and E-11.
- Arrange for the battery system's dealer to approve the design, and inspect the installation upon completion, to confirm its compliance with the manufacturer's guidelines.
- Check with your insurer to confirm they have no prohibition or stipulations for use of lithium-ion batteries.

Lithium-ion marine house batteries are here to stay, and I suspect they will rapidly overtake conventional lead acid batteries. The fires we have seen are, in many cases, where this can be determined, related to over-taxing of existing wiring and components. Because LI batteries are capable of accepting very high rates of charge, for extended periods, they are prone to placing strain on marginal, and defective, wiring and components that otherwise endured in lead acid systems. LI systems will test the integrity of any electrical system, particularly the DC side, so it's imperative that the installation be as close to flawless as possible, and again fully ABYC compliant.

Conventional fire extinguishers are not especially effective against a LI battery fire, that is, if the battery itself catches fire. The most effective means of extinguishing such a fire is water, and lots of it; there is no silver bullet for these fires, yet. You should keep at least two (one in the PH, and one near the engine room) portable gaseous fire extinguishers aboard for use on small electrical fires, see this article for details.

You can read more about LI battery systems and their special needs here.

Dear Steve,

I read your reference cell testing article dated Aug 2021. I have haloing around some of my underwater parts. Mostly around bronze through hulls, but also around the trim tab attachment point and the diver's plate. The metals do not appear to be deteriorating, or have de-zincification.

My Cruisers Yachts 460 Express sits in brackish water at the marina in Pensacola. I have Aluminum anodes. I tested with a silver/silver chloride reference cell and Yacht Corrosion Consultants Test meter. My reading was -925 mv.

The anodes (shaft, trim tab, thruster, & Divers Plate) are deteriorating "equally". I tested my Galvanic Isolator and it is working. Diodes tested in both directions: 1.016 V / 1.032 V.

I am being told by marine technicians that I am "over-zinced".

What is causing the haloing and is it dangerous? Where do I go from here?

Any ideas are greatly appreciated.

Brian Fitzpatrick

Brian:

It’s important to note that over-protection of a fiberglass vessel is not harmful per se, other than to anti-fouling paint, and that issue can be resolved with a two-part epoxy applied to bonded underwater metals where halos and/or paint failure are occurring, see the link below. -0.925mV is not over-protected for a fiberglass vessel, however, while that may have been the protection level when it was measured, it may have been higher at other times previously. Presumably you tested the entirety of bonded underwater metals by connecting the test meter to the bonding system? I would also suggest testing the individual underwater metals you mentioned to determine if some are more protected than others. Ideally, if the bonding system is in good condition, they should all reside at the same voltage. Regardless, halos are an indication of some degree of over-protection, at some time. More on halos and their prevention here.

Hi Steve,

I found your fantastic article on stuffing boxes from February 2017.

Unfortunately, this year I sheared off the locking nut on the end of the collar stud. It looks exactly like the one pictured in the article and is stainless steel. I would like to repair it in place. Will the stud unscrew from the body or might it be pressed in? If I replace both, do you recommend brass replacements?

Thank you for your time,

Joe Gogal

Joe:

Those stuffing boxes are used on the GB’s were typically

locally made, which is also true for many vessels built elsewhere in Asia, so each is a little different. However, the stud should unscrew from the stuffing box housing. The manufacturer may have dimpled the bronze around the stud to capture it, or they may have used resin or another thread locker to retain it, however, you should be able to back it out using two nuts locked against each other, or a locking pliers, in that order of preference.