April 2018 Newsletter

Ask Steve

Steve:

I have just had my boat surveyed for insurance purposes. Most recommendations are easily dealt with, but he has come down hard on my fuel tank sight gauges. He believes the material could fail in the event of a fire, and possibly contribute diesel fuel to the fire. I've attached a couple of photos of what I have. The previous owner installed 4 new aluminum tanks on the vessel (Krogen 42, 1985). Each tank has a gauge with petcocks on either end, with a flexible ?plastic? material of unknown composition. I should add that some of the petcocks ?weep? if left ?open?, so I ensure they are closed. I should probably consider a replacement for the petcocks. What material do you recommend? Is Teflon an acceptable material? How should they be shielded?

Jim Cave

Jim:

The surveyor's observation is a bit curious, as virtually no clear hose material I've encountered meets the ABYC 2.5 minute flame exposure standard. However, it is for this reason that ABYC Standards also mandate that sight glasses be equipped with valves at the top and bottom, and that these valves remain closed other than when checking fuel level.

ABYC H-33.5.8 A means to determine fuel level or quantity shall be provided.

33.5.8.1 If a sight gauge is used,

33.5.8.1.1 it shall be equipped with a shut-off valve at the top and at the bottom of the gauge, and

33.5.8.1.2 a warning label shall be placed adjacent to the sight gauge, and

With the valves closed only the quantity of fuel contained within the sight glass can leak (into the fire). There is no requirement per se for the makeup of the hose itself used for the sight glass. Thus, it would seem your system is primarily compliant.

The leak should be corrected, and your fuel polishing system filter bowl requires a heat shield and a plug in the drain valve. Also, while it's unused and capped, and thus probably not an issue, strictly speaking, the gate valve shown in one of the photos lacks ABYC compliance. Gate valves lack compliance because their condition, open or closed, cannot be determined by merely looking at them. They should not be used in fuel systems.

Hey Steve,

I always enjoy your articles. I could use a bit of help. I friend of mine is building a 54 foot steel sailboat and is almost ready to begin the electrical wiring. Being an electrician myself, I am a marine electrician as well as commercial and industrial and I have an ABYC manual for reference.

Long story short, he would like me to help him wire up the yacht. He was a yard manager at Brooklin Boatyard and a certified welder.

Can you suggest some books or tech literature I can reference so I can do it correctly?especially the whole ac/dc grounding/bonding issue? I have already suggested an isolation transformer, but that's just the tip of the iceberg.

Help me if you can, go in the right direction. He has offered to take me to the islands when it's finished?I want to make sure I don't screw it up.

Thanks,

Tom Curran

Tom:

I'm going to use this question in my Ask Steve column, as many readers will benefit from the response. While there are a number of texts that may be beneficial the one I've consistently recommended is Charlie Wing's ?Illustrated Boat Owner's Electrical Handbook? 2nd edition. Among other things this book walks readers through the complexities of marine electrical systems in straightforward and easy to understand terms (something that's missing from other notable marine technical books). It includes sections on AC and DC wiring as well as corrosion prevention.

Having said all that, it will be critically important for you to thoroughly understand and implement all relevant ABYC Standards., to ensure the vessel's electrical system is safe and reliable.

Finally, you may find this column on AC neutral to ground connections of interest.
http://proboat.com/2011/10/demystifying-the-neutral-to-ground-connection/

Steve:

I have previously attended one of your lectures and have certainly benefited from reading your articles and newsletters. We have a 48 foot Kadey Krogen which we had made in 2011 and every year we spend about 6 months aboard in the winter time cruising the Bahamas. The boat has really been a pleasure to own and we have had very few unexpected difficulties. However we do have one area that is an annoyance and it is the use of aluminum with stainless steel fasteners in some of the components and walking many marinas it appears that it is a very common problem. Perhaps in some of the components such as the Diamond Seaglaze doors, or the Steelhead davit stainless fasteners are necessary (perhaps) for strength in some locations. In other areas such as aluminum vents etc. I don't see that there should be any great need for an extra strong stainless screw. I think that the airplane industry uses a lot of aluminum in their construction and would imagine that corrosion is an even a more dreaded thing in that situation. I'm also of the belief that static electrical charge is an ongoing issue with airplanes. When you board an airplane and look at the door frames they certainly utilize bolts and screws in fastening them to the airframe which is also painted and they never show any corrosion or the typical bubbling of paint that we have to put up with on our boats and I believe that they also use the same kind of paint.

So I guess my question is if the airplane industry has solved this problem could the boating industry not have a look at what they do? Perhaps there are airplane grade aluminum fasteners etc. that could be utilized in boat construction where aluminum is involved. I can't see where a couple of hundred specialized aluminum fasteners could be such a price that they would be extremely material in the pricing of boats. I have gone through all of the areas on board our boat that I mentioned and removed all of the fasteners that I could and made sure that there was ample Teff Gel used when I refastened them. That certainly seems to have helped but it doesn't solve the problem. Do you think that there is a type or grade of fastener that I might purchase to replace the stainless steel ones after repainting and touching up the paint so that it is not a continuous problem?

Thank you,

Perry Stickles

Dear Perry:

You've posed an excellent question on a subject about which I'm passionate, paint, aluminum and their interaction. While there is some degree of galvanic incompatibility, and thereby galvanic corrosion, between stainless steel and aluminum (because aluminum resides in a very ignoble location on the galvanic series, it will interact with virtually any metal, not just stainless steel, when exposed to an electrolyte), the issue surrounding paint failure on aluminum is more a case of poultice corrosion. That is, areas where fasteners, and their holes, penetrate paint, breaching its otherwise contiguous coating, allow water to migrate into, and become trapped between the paint and aluminum substrate. Poultice corrosion sets in when the aluminum is exposed to this stagnant, oxygen depleted water, which in turn creates aluminum hydroxide, which in turn creates the unsightly paint blisters associated with this phenomenon. The fact that the fastener is stainless steel plays only a small part, and I strongly suspect it would change very

little if aluminum fasteners were used. I also suspect this is less of an issue in the aviation industry because of the engineering that goes into fuselage design, all sharp edges are rounded (sharp edges promote paint failure), rivets are faired smooth and then they and the aluminum skin are painted. Additionally, aircraft are inspected for this issue regularly and repairs carried out as soon as paint failure becomes evident.

The real key to preventing paint failure on aluminum substrates is ample bedding. Each time a fastener is screwed into, or hardware installed over, a painted aluminum structure, it fractures the paint, even if only microscopically. Each fracture becomes one of the aforementioned water ingress locations. If, however, fasteners and hardware are thoroughly bedded in polyurethane sealant, the fractures are sealed, and the incidence of paint failure is diminished dramatically. For more on this subject, see http://stevedmarineconsulting.com/paint-and-aluminum-how-to-ensure-a-good-mix-2/.

Steve:

Currently mounting an aluminum Edson radar support on my aluminum mizzen mast, with support having provision for twelve 3/16" rivets. Do you advise aluminum rivet with aluminum mandrel, or stainless rivet with stainless mandrel with Tufgel application to diminish potential electrolysis; the stainless rivet having 2-3 times the shear and tensile strength of aluminum. My own feeling is that the 500 lb shear and 450 lb tensile strength/aluminum rivet (per Hanson specs.) should be more than adequate, avoiding any risk of electrolysis.

Thank you for what you do.

Robert L. Marcus, M.D.

Dear Rob:

The primary concern in an installation such as this is poultice corrosion, corrosion that is peculiar to aluminum, it occurs when the paint on a mast or bracket is breached or fractured by the fastener, rivet, screw etc. In order for aluminum to remain corrosion resistant, it must be exposed to oxygen, which enables it to form a tough, oxide film. However, when water migrates under the paint breach, it interacts with the aluminum, and because the area is not exposed to air, the aluminum corrodes, developing the familiar white, frothy, aluminum hydroxide, which in turn further lifts the paint, creating a larger and larger, and more unsightly, paint blister or bubble.

For the most part this is easily prevented by liberally bedding fasteners and brackets in polyurethane or polysulfide bedding compound. The bedding compound fills paint breaches, thereby preventing poultice corrosion from ever achieving toehold.

While proprietary thread compounds effective at preventing thread seizure, for stainless fasteners threaded into aluminum substrates, they simply act as an insulator between the two, while excluding moisture. They do nothing to prevent the paint breach issue, and any virtually compound, including the aforementioned sealants, that fill the gap between threads will accomplish the same goal.

For more on this subject see the column I wrote entitled, ?Paint and Aluminum, Ensuring a Good Mix? http://stevedmarineconsulting.com/paint-and-aluminum-how-to-ensure-a-good-mix-2/.