January 2018 Newsletter

Photo Essay: Shore Power Plugs and Fire Prevention

Statistically, more boat and marina fires occur as a result of shore power than any other single cause, and more of those occur at the connections for shore power plugs and receptacles than any other location. In my experience, and frustratingly, nearly all of these are avoidable.

The potential energy available to a shore power connection, anywhere from 3,600 Watts to 12,000 Watts, is substantial to be sure; its ability to generate heat should not be underestimated. By comparison, a large space heater or hair dryer uses, or provides, a mere 1,500 Watts of heating energy.

Because shore power connections are made and broken routinely, the likelihood of developing a poor or high resistance connection is only exacerbated. In the world of electricity, resistance equals heat, in fact, the aforementioned space heaters and hair dryers rely on exactly this principle in order to operate.

In this month's image, a 120 volt 30 amp (3,600 Watt) male plug is shown. Not only are its blades heavily oxidized (it looks as if this fell overboard once or twice), perhaps equally as concerning is the missing locking ring. When this plug is used with a connection that supports such a ring (a Y adapter for instance), the ring must be used, securing the plug in place. Unfortunately, nearly all dockside pedestals lack the ability to engage such a ring, making it especially important for users to ensure the cable is well-supported, with a wrap around the pedestal or by lashing it in place.

Inspect your cord connections regularly, clean contacts and use a corrosion inhibitor, secure cords, and replace missing locking rings and you'll substantially reduce the possibility of overheating and fires.

Ask Steve

Hi Steve,

I saw your article on measuring exhaust pressure and thought I would share an experiment we did when I worked at Cabo Yachts. It all came about because we were asking our riser manufacturer to put a port in the riser as close as possible to turbo flange so we could measure back pressure. We kept coming up with back pressure numbers that were good on one boat and not great on the next.

I noticed that the riser fabricators didn't always get the port in the same place around the turbo flange and suspected that might be the problem. So we built the riser in the attached drawing. As you can see measured back pressures were all over the place. From that point on we always spec'd the port be perpendicular to the first bend of the riser (9 and 3 o'clock). Many engine manufacturers, if not all, now put their own ports in the engines which is where they want the pressure measured, but if you are depending on a riser manufacturer to place a port, then it really matters where it is on the riser.

Just thought you might be interested. Have a good weekend.

Phil Arnold

Pacific Asian Enterprises/Nordhavn

Attachment

Phil:

Thank you for sharing this valuable information, things are rarely as simple as they seem.

Steve,

Excellent article, as always. It raises a question, though. Instead of a vacuum gauge on the filter manifold, why not do so as I have on a couple of my previous boats and put the gauge at the helm? No need for a drag needle, the operator monitors it real time. Using a flexible hose to connect the manifold to the helm-mounted gauge may not produce exactly accurate readings but all we need is relative readings indicating change in vacuum. Obviously a tight, secure installation is essential to prevent air leakage into the system.

Sincerely,

Terry L. Johnson

Terry:

Remote vacuum gauges make a great deal of sense, I've installed many for customers over the years. It's a luxury to be able to monitor vacuum real time from the helm. Having said that, Racor mandates that remote gauges that are more than ten feet from the filter must be plumbed with metallic tubing or pipe (plastic can't be used as it lacks fire resistance). Hose runs over that distance can introduce inaccuracy into vacuum readings, and I'd argue that actual rather than relative readings are mandatory, 4 inches of mercury, for instance, is acceptable while 10 is not. And, the longer the run, the greater the possibility of a leak. Again, no issue with remote vacuum gauges provided they are installed and plumbed properly. While it doesn't provide real time monitoring, the drag needle gauge is simply easier to install and offers less risk of vacuum leaks.

Dear Steve,

I read with interest your article on zinc and aluminum sacrificial anodes online in Cruising World magazine. My issue is that I do not seem to be able to find aluminum anodes for my twin Cat 3208 engines. One manufacturer told me that they do not make them for engines because they are too delicate for that use. My boat is kept in fresh water except for a few times at a week to a month in salt water, (Puget Sound). Is this an issue? The engines are fresh water cooled with heat exchangers.

Carlos Velategui

Carlos:

Conventional zinc anodes are of limited effectiveness in fresh water, when they are exposed to this environment they develop a coating that passivates them, thereby making them inactive. Having said that, if you are unable to find pencil anodes for your heat exchanger I'm not sure I'd worry too much about it as a fresh water environment is far less corrosive to the metals found in a heat exchanger. The primary issue is for those venturing into fresh water briefly, for a few days for instance, then back into seawater. In that scenario, the mixture of seawater and inactive zincs, can present a greater corrosion risk. Furthermore, aluminum anodes often develop a white frothy coating, which has no effect on their performance, however, when used in a confined application like a heat exchanger, it can make them difficult to remove when it comes time to replace them. You can safely use aluminum anodes on your hull, and zinc anodes in your engine as they effectively reside in different bodies of water, and therefore will have no effect on each other.

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 built 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

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 (aluminum corrosion is described in this article http://stevedmarineconsulting.com/wp-content/uploads/2014/03/Aluminum-Corrosion-Cruising-World-May-2017.pdf). 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, and all fasteners are installed using a sealing compound to help maintain cabin pressure and make the fuselage watertight. Incidentally, I too look carefully at aircraft door frames as I board for the same reason, and I look for cracks, look up Aloha Airlines flight 243. 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/.