May 2017 Newsletter

Photo Essay: Steering Component Inspection

Text and photos by Steve D'Antonio

Steering represents one of the most important systems aboard, at least equal to propulsion, electrical and raw water plumbing. On too many occasions, however, the components that make up this system are given short shrift, users assume they are basic, simple (and out of sight) and thus will always work, reliably, with little in the way of maintenance or inspections. Until, that is, a failure occurs, and you can rest assured that such failures rarely occur on a glassy-calm, protected estuary. Quite the contrary, steering systems most often fail when they are stressed. On a passage I made a few years ago, from Scotland to Iceland, the vessel I was aboard encountered punishing sea conditions, short-period 8-12 foot waves that simply battered both boat and crew alike. It's at times like these that I can't help but think about steering linkage design and maintenance, how the ram is secured to its shelf, the interface between piston and tiller arm, and the type of, and tension on, fasteners that clamp the tiller to the rudder stock. While generally simplistic in their design, all of these components can present weak links which, if they fail, will lead to a loss of steering. In extreme conditions like those mentioned above, this in turn could lead to foundering.

The most effective way to avoid such unplanned mishaps is by careful, regular inspection of these parts. Among other

things, look for signs of wear or fretting. Fretting is the process wherein two pieces of metal rub against each other, with the byproduct often being fine metal dust, which typically oxidizes to a brownish hue. The accompanying image depicts just such a scenario; and it’s one that should not be ignored. While it can occur for a significant period before a failure occurs, fretting is neither normal nor acceptable; its cause should be identified and resolved without delay.

Ask Steve

Hi Steve,

I attended the spring workshop, which was great by the way, and thought I would touch base with you on this.

This past weekend I had an unfortunate encounter with a submerged uncharted rock that damaged one of my props on my 1999 Azimut 46. After the boat was hauled and the yard manager took a look he asked if I knew anything about the discoloration of the props. He said it looked like a “halo” effect possibly from heat treating or corrosion. I’ve only owned the boat for a little over a year and nothing was ever mentioned about them. I purchased the boat from the original owner. Can you tell anything from these pictures?

Appreciate any insight you may have.

Thanks,

Dan

Dan:

Ouch…operating vessels without keels places special burdens on navigators. I hope the repairs weren’t too costly.

I love a good metallurgical mystery. Unfortunately I don't believe this is one of them (and once cast, bronze propellers are not heat treated per se). If this were a corrosion issue the metal would be bright and clean, and pitted, and that doesn't appear to be the case. If I had to hazard a guess, based on the photos alone, I'd say it's a mild case over-zincing, which is a bit like the opposite of corrosion. In that case, an alkaline solution is formed around protected underwater metals, which can cause this sort of discoloration. It's not harmful per se (other than to aluminum and timber vessels). If you were concerned, it could be tested and verified by a (preferably ABYC certified) corrosion technician, using a reference electrode and a multi-meter.

Hi Steve,

Looks like the insurance surveyor may be giving us a hard time about tuning/balancing the props on our boat. They have agreed to replace the starboard prop but the shop is recommending that the 2 props be balanced/tuned. First question is, is it necessary and second would this be considered an "upgrade"?

Dan:

In a word, yes, it is necessary. I wouldn't place a new, out of the box prop on a shaft without conducting a scan using either PropScan or Hale MRI. In 75% of the scans I recommend, some work is needed to bring the prop into spec. The analysis is typically free, and it generates a report that can be quantified. Adjustment of course would cost you. For the vessel like this, the props should meet ISO class 1. If they don't, then that will be clearly identifiable on the graph that's created by the scanning system. You could then use that to prove to the insurer that the props, in their virgin state, are below the minimum acceptable standard for a planning recreational vessel. If they won't pay for it, you should, it's worth it, and you can keep the scan report so the

props can be returned to this condition should they ever be damaged again in the future. Once the props are installed the vessel should be sea trialed in full cruising trim, full fuel and gear. The engines should turn up to their full rated rpm, and ideally just a little more, between 25 and 40 rpm more.

If the prop shop doesn't use a scanning system, then I'd find one that does, these days it's common and, in my opinion, essential.

Hi Steve,

I'm presently in the process of refitting my 44' Gulfstar Sloop in the Bahamas.

Recently read your article in a Professional BoatBuilder magazine titled "Beware the Brass". Your article was very informative. My problem is in that I'm ordering Groco bronze sea strainers and will use bronze fittings where available. The sticky part comes in finding straight elbows, street elbows, nipples and hose-to-threaded fittings.

I did find a good source for these at the Boat Owner's Warehouse. The sales people have been very helpful, but having read your article I'm reluctant to use any of these fittings that at labeled as 'RED BRASS" for the fear of failures mentioned in your article.

I also looked at a West Marine article on the net where they state "Bronze fittings used for seacocks are fine for use in saltwater…….."

Silicon bronze and leaded read brass make good seacocks.

Point is …. In the Boat Owner's Warehouse Catalog they don't mention 'leaded' red brass.

As I don't want to find myself with serious corrosion problems

or even worse a boat loss due to ignorance maybe you could help to clarify the use of Red Brass to be used in a saltwater environment coupled to bronze strainers (for example).

Doing some reading on the cruiser's forums etc. it seems that finding bronze fittings is becoming more difficult. Any web sites that you could direct me to would be most appreciated.

I greatly trust your knowledge and experience.

Best regards,

John Taylor

John:

You've posed a very good question, one more boat owners (and builders) should be asking.

Generally speaking, as long as the zinc content of leaded red brass is less than 15%, it is considered acceptable for use in seawater. As you are discovering, however, verifying the alloy of any part, barring those you order from a supplier that specifically warrants their makeup, can pose risks. I've seen many leaded red brass pipe nipples fail in seawater applications. None are stamped or otherwise marked to indicate their zinc content.

European manufacturers have addressed this issue where seacocks are concerned by coming up with a DZR designation, which stands for dezincification resistant. However, some of these alloys are up to 40% zinc, which seems, to me incongruous, although the dezincification is seemingly inhibited with the addition of other metals. My personal preference is for true bronze, which is zinc-free, or nearly zinc-free, or only contains amounts of zinc, under 15%, or reinforced non-metallic components, although the latter are only available in a limited selection, typically just pipe to hose adapters.

I've read the West Adviser material, wherein I'm quoted, although somewhat out of context (I contacted them to point this out, and received no reply). Bottom line, for copper alloys such as bronze or leaded red brass, the less zinc the better and definitely no more than 15%. It's very difficult to machine pure silicon bronze, which is why many seacocks include a small amount of zinc and/or lead.

An ASTM standard exists for copper alloy and zinc content, it is as follows, in decreasing order of corrosion resistance, B-61 3-5% Zn; B-62 4-6% Zn; B-584 7-10% Zn. The problem is, unless the alloy is verified from the retailer, knowing what you are getting can be difficult.

If you are concerned about the potential for corrosion, as all vessel owners should be, ordering your bronze components from a reputable supplier, one who warrants the alloy, such as Groco or Buck Algonquin, is one viable route.

Hi Steve,

I am going to install a vacuum gauge on my dual Racor filtration system. I would like to put the gauge on my helm station about six feet from the filters because it will be easier to check. I am concerned that if air gets into the system that it won't bleed out of the line because it will be about two feet above the engine. How do other people deal with this problem? I also can't find a gauge for a helm station that has a drag needle. If you know of one can you please let me know.

Thanks,

James Trimblett

Jim:

Installing a vacuum gauge makes good sense, as it will alert you to fuel filter clogging problems long before they become

critical. Remote mount gauges are less popular with the advent of the drag needle style, the only time they are really valuable is in the event of an acute filter clog, which is not terribly common. Typically, a filter-mounted gauge with drag needle will suffice.

If you choose the remote mount option, as long as the run is this short, less than ten feet, you can safely use hose, as long as it's Type A fuel line (don't use plastic tubing). Air shouldn't be a problem, if it gets into the hose leading to the gauge, the gauge will still work, as it will still impart a vacuum on the gauge mechanism, and it will essentially remain in the hose, and thus will not be an issue for the engine. If it did leave the hose, the amount will be very small and would likely be passed by the engine's fuel system without incident.

As far as vacuum gauges are concerned, I'm partial to those made by WIKA, you can obtain a stainless steel, liquid-filled, back or "CBM" dash mount model from FN Cuthbert Company.

Steve,

I stumbled upon your article on the routing of the AC green safety grounding wire to the engine grounding block. My boat is correctly wired with that wire going directly to the engine ground bolt on the bell housing but I noticed the AC white neutral ground wire is also routed to that engine ground bolt. Should the white neutral wire be connected to the engine ground?

James Cooper

James:

Proper connection of neutral and ground conductors is critically important both ashore and afloat, but more so in

the latter case because of the conductive medium in which boats operate. Neutral and ground inter-connectivity aboard a boat is generally prohibited, at least in the example you've described, with a few exceptions, one being the presence of an isolation transformer. If the ground and neutral are connected in the absence of a transformer, then there is the possibility that current can return via the water in which the boat floats, posing a potential for electrocution, and increasing the risk of corrosion, as this connection can bypass a galvanic isolator.

This subject is explained in greater detail in an article I wrote for the marine trades, viewable at http://www.proboat.com/demystifying-the-neutral-to-ground-connection.html.