July 2023 Newsletter: Steering Gear Wear

Photo Essay: Steering Gear Wear

Steering gear falls into the category of a ‘key system’. Without it you are not only dead in the water, a failure could lead to loss of control, a serious accident, or worse. It is, therefore, critically important that it be designed, and installed properly, and within the manufacturer’s guidelines; as well as being subject to regular inspections.

Inspections should be carried out both formally and casually. Casual inspections can occur any time you can see steering components, while formal inspections should occur at least monthly and they should be carried out both dockside as well as underway. I’m surprised at how often I inspect a steering system and find obvious defects, those which can be readily observed by even an untrained observer, including loose fasteners, signs of movement where none should be present, leaks, and fretting (a type of wear that often generates fine dust-like particles).

In the image shown here gray metal dust is visible beneath the interface between the rudder tiller arm and the hydraulic ram. Normally, an articulating ball is located at the end of the ram, which prevents metal to metal contact. Some rely on a non-metallic insert, while others are greaseable via a zerk fitting. In either case, wear is minimized if not prevented. Metal dust like that shown in this example is a clear indication of either a design flaw or assembly error; regardless, it should be investigated and corrected before a failure occurs.

Ask Steve

Hi Steve,

I have a 1988 vintage 8KW Onan Generator on a 1988 Grand Banks. There is a galvanic corrosion issue on the generator seawater cooler that I cannot solve. The small zinc in the cooler will be corroded in about 2 months and the inlet pipe on the cooler has corroded twice to the point where it has a hole in it and leaks.

The cooler was not separately grounded when I bought the boat. The new coolers have a ground lug so I grounded it to the bonding system immediately next to the generator seawater inlet valve and strainer. The bond was verified good when the boat was out of the water in June 2022.

The boat generally goes through shaft zincs faster than normal, maybe every six months. I operate mostly on the east coast in saltwater. There are galvanic isolators in the forward and aft shore power ground wires, they are verified working. I replace the shaft zincs by a diver as needed. I also use a zinc “fish” over the side attached to a transom zinc when not operating the boat for any extended time more than a couple of weeks.

I have a corrosion reference electrode and have run some tests, but that work has never shown me any issues.

I don’t have this problem on the main engines, their zincs last a very long time. I have never seen any evidence of galvanic corrosion anywhere else on the boat (yet!).

What else can I do to stop this corrosion on the generator seawater cooler?

Thank you.

Hubert Hopkins

Hubert:

To clarify, when you say “seawater cooler” I assume you mean the heat exchanger.

Bonding the heat exchanger doesn’t hurt, however, it will provide no additional protection for galvanic corrosion, as the heat exchanger is in a different body of water than the anodes on the hull. Bonding can prevent or reduce stray current corrosion, and that may be what you are experiencing, albeit in a limited fashion, as it is usually very rapid and destructive. I would check current flow on that conductor (if present it will likely be very low, so best to use a multimer’s test leads rather than an inductive amp clamp) both at rest and when the gen is running, and with the genset’s battery connected and disconnected.

When you say, “The boat generally goes through shaft zincs faster than normal”, that’s subjective, “normal” varies from vessel to vessel, the load on the anodes, the salinity, temperature and current of the water in which the vessel floats all affect anode consumption. Assuming you are replacing them when they reach the 50% depletion mark, six months doesn’t seem unusual to me. You mentioned you measured the protection level of the bonded underwater metals using a reference electrode; if that’s in the normal range for your FRP hull (-750 to -1,100 mV) and underwater metals, then you know the system is working properly. You might try aluminum anodes if you haven’t already. More on reference cell testing here.

You can check with Onan, however, I suspect the cooler, if bonded, should be connected to the genset’s block, rather than directly to the vessel’s bonding system. It would ultimately be connected to the bonding system, as the genset block is, or

should be, bonded via a dedicated bonding cable if the block is not current-carrying, i.e., the starter and alternators use an isolated ground, if not, then the block should not be bonded, but it would, or should, still be connected to the bonding system via the DC negative circuit. If the heat exchanger is otherwise electrically isolated from the engine, then you should be able to measure abnormal current flow through the bonding wire. More on bonding internal disparate raw water components here.

The galvanic isolators should be ABYC A-28 compliant, and you noted they were tested for proper operation. Even if they weren't working, or not present, they should have no bearing on the generator's heat exchanger corrosion resistance, once again because it resides in a different body of water than the vessel's hull.

If abnormal current flow is the culprit in this case, it can be measured, and corrected.

Steve,

I read your article about installing deck hardware (found here) and understand that cleaning the newly manufactured plates will likely be required for bedding material to adhere. Can you suggest a cleaning solution, where to use it on the chainplate and a suitable bedding material for this application? I assume Polysulfide (3M 4200UV?) would work well? I too, remember when 5200 was ubiquitous and we used it for everything, but I anticipate owning this old girl for many years and would like to use a product that I have a fighting chance of removing and replacing while working on boats in exotic places.

Thanks for any help you can offer.

Dave Scola

Dave:

Because of their cyclical loading and frequently wet location, chain plates represent one of the more challenging bedding applications. Chain plates should be thoroughly cleaned following the guidance included in this article.

Given the choice, I would use either a polysulfide (3M 4200 is not a polysulfide, it is polyurethane based) or a polyurethane such as 3M 4200UV, in that order. Polysulfide is more resistant to teak cleaners and other chemicals, and I find it adheres to stainless steel better than polyurethane. The stainless in the area where the bedding is applied should not be polished, you can profile it using 120 grit Emory cloth. Doing so will enable better adhesion between the stainless and sealant.

Dear Steve:

The overcurrent protection on my house bank cable is located at the terminus in the electrical locker in the engine room. This is a previous install. I want to rethink this and move it much closer to the battery bank…

I have two battery boxes with 4 T-105’s each with 2/0 cable. My intent is to have 2 short lengths of cable (~18”) from the battery boxes to a Class-T Fuse Block. I realize this is 18” instead of ABYC 7” but, I think this is the best I can do and I don’t think mounting a fuse on a stud on the “last battery” in each box will work in this instance; the cable run is about 12’ each way.

I have been using the Blue Seas circuit wizard to do the calculation for the size of fuse and cannot get it to work. It asks for cold cranking amps and it’s not specified in the T-105 spec sheet. I think that’s where it’s tripping up.

I’m thinking of landing at 250-amp fuse, Class-T, but I remain uncertain.

Thoughts?

Sincerely,

Jim Cave

Jim:

ABYC Standards allow for over over-current protection to be located as much as 72” away from the power source, provided the conductor is “sheathed” (this could be standard flame retardant corrugated split loom material).

I would contact Trojan directly to get the CCA/MCA for the battery. I assume you are pairing these in series to obtain 12 volts, in which case the CCA/MCA would remain constant.

According to ABYC ‘TABLE 4A – AC & DC Circuits – Allowable Amperage of Single Conductors Not Bundled, Sheathed, or in Conduit’, a 2/0 cable with insulation rated at 105C, has an ampacity of 280 amps, when run inside an engine space.

More on over-current protection here.