

# August 2019 Newsletter

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## Ask Steve

**Hello Steve,**

During the last haul out period, we dealt with a number of issues with the underwater metals, wing engine strut was heavily pitted, main engine shaft had heavy pitting yet zincs appeared to be in good condition. All underwater metals were remedied, shaft replaced and wing strut repaired. Just this week we hauled the vessel again to install an aqua drive system and I noted that the wing engine anode was significantly deteriorated, roughly 60-65% remaining while the prop anode showed little deterioration. The anode on the main engine had little to no deterioration.

Having read your article regarding bonding and corrosion protection and your reference to uneven consumption of anodes lead me to look at the bonding for the wing engine. The wing strut has no bonding wire leading to it and I can find no evidence of a bonding wire being fit to any component on the wing. My thought, having read your article, was to fit a carbon brush as you suggest in your article and then I came across this from Legacy Nautical Boat Builders and I would value your input.

Thanks in advance and I appreciate your many articles.

Best regards,

Todd Patterson

**Todd:**

First and foremost, if the vessel experienced pitting on under

water metals, then a stray current scenario almost certainly exists. Stray current corrosion is very serious as it can cause significant damage in a relatively short period of time; so much so that it can lead to flooding and sinking. Therefore, that issue needs to be identified and resolved before the vessel is launched. It is possible for stray current corrosion to occur, while not consuming anodes if they are isolated from the bonding system.

The role a bonding system plays in stray current corrosion is one of mitigation; it does not solve the problem, it merely addresses the symptoms, ideally allowing stray current to return to its source via the bonding system, rather than through the water, where it can cause underwater metal damage. I'll repeat, if the source of the pitting was never identified, it must be.

Now on to the shaft grounding device whose information you shared. The shaft strap is simply another means (typically this is a carbon brush on a copper wand) of connecting the shaft/prop to the cathodic protection being provided by hull anodes. The braided copper is a poor idea at best. In fact, it's not permitted for use by ABYC in bonding systems for cathodic protection. Copper is very soft, and it will undoubtedly suffer rapid wear when riding against a rotating stainless steel shaft, particularly because it has to be kept tensioned to maintain electrical contact (is the spring stainless steel, few are?). The tin plating will wear away rapidly, exposing the copper, which will also oxidize when the vessel is idle, further compromising the connection at rest. This is one of the reasons carbon brushes have been used traditionally, they are immune to such oxidation. The flawed design aside, based on the description of the strap, having said something about 'shorting corrosion currents to ground' the manufacturer doesn't appear to entirely understand the finer points of cathodic protection, further eroding my confidence in the product. Their boat designs, on the other

hand, are lovely, they should stick to that and leave corrosion mitigation to others who specialize in that field.

While still imperfect, my recommendation would be to use the traditional copper wand-carbon brush design. The standard version is commonly available and inexpensive. Truthfully, however, these are marginal at best, and offer no protection whatsoever, but they don't hurt either. If you wish to use one that is of a higher quality and reliability, a 'slip ring' design, you can go with something like this.

**Hello Steve,**

I'm considering purchasing a 30 year old Tartan 40 with a Universal M-50 Engine. Engine hours are unknown, as the gauge stopped working at 634 hours, unknown how long ago.

It starts quickly, with no excessive exhaust after a 5 minute warmup. Any advice or recommendations to minimize the risk of a near-term major overhaul or replacement?

Thanks,

John R. Smith

**John:**

Testing for an engine like this can run the gamut, however, at the very least I'd carry out an oil analysis, which will, if performed and interpreted properly, identify serious faults such as the presence of seawater or coolant, as well as excessive metal accumulation, in the oil. You can learn more about that by watching this instructional video on my website and reading this article.

Inoperative hour meters make me nervous, which would encourage me to do more than a cursory review of the engine.

If you want to go the next step, have a mechanic carry out a crankcase pressure test. This is sort of a poor man's (read less costly) compression or cylinder differential leak-down test, which you can read more about here. While not as definitive as a compression or leak-down test, it will identify excessive blow-by, which can be caused by cylinder glazing, which in turn may be the result of extended light loading, for which sail auxiliary engines, or their operators, are notorious.

This response, from an 'Ask Steve' column, covers the subject of cylinder glazing...

Glazing refers to the appearance, which is smooth, and shiny, ice-like, however, a coating or "filler" of sorts does form. The actual process is somewhat complex, and it's broken down into two sub-groups, glazing and polishing. In the former, combustion byproducts, as well as oil and fuel, combine and oxidize to fill in the valleys between or grooves in the cross hatch pattern, creating the smooth finish. The effect is usually uniform and it sometimes has a yellowish appearance.

In the latter, carbon deposits on the rings and piston ring lands prevent the rings from floating, and self-adjusting during piston movement, as well as inhibiting expansion and contraction during heating cycles. This leads to excessive and uneven pressure being placed against the cylinder wall by the seized ring, which leads to wear (as opposed to the deposits in the case of glazing). The effect is often localized vertically on one region of the cylinder wall.

The terms are often used interchangeably, and I confess I'm guilty of this, strictly speaking, however, they are different.

Both can be and often are the result of extended light load operation.

Finally, this article provides a description of the ideal

engine survey process; the load testing detailed within is particularly important.

**Hi Steve,**

I'm currently bringing my boat north heading back to New Hampshire, now in Swansboro, NC. I have a Nordhavn 43-07. Currently both my main engine alternators are not charging my batteries. I can charge with my generator, which is keeping me going. Do you think I could have a burnt fuse somewhere between the key switch and alternator, thereby not letting the exciter work? Any help would be appreciated.

Bob Jodoin

**Bob,**

I'm presuming this is a Lugger engine?

The fact that both aren't working is unusual. It is possible they share the same power supply from the key switch, and it is possible that uses a single fuse. It's also possible wiring has been changed over the years, so no way for me to be sure if it is stock. I would begin by checking wiring and fuses behind the ignition switch. If those all look good, if you have a multimeter and know how to use it, carefully, with the engine running, and battery charger off, measure voltage at the field wires on the alternators, they should be marked on the alternators with something like "F+", and it's a small wire, it may be blue. It should be somewhere between about 3 and 12 volts, depending on the demand, higher if demand is high, lower if demand is low.

If that is 0, then there is indeed a field power supply problem.

**Dear Steve,**

I would be interested in your thoughts on keel cooling for marine diesel engines. I will be replacing both of the engines on my fiberglass trawler in the next year or two and am considering the pros and cons of converting to keel cooling at the same time.

Thank you.

Don Million

**Donald:**

Keel cooling is an effective and reliable means of cooling marine engines. Its primary advantage is it eliminates the need to pump seawater into the vessel, and pass it through a heat exchanger, and then expel it with the exhaust, and thereby eliminating the maintenance and failures associated with these raw water system components. Instead the engine's coolant is passed through a keel cooler on the outside of the hull, which does require some maintenance and cleaning from time to time, albeit far less than a raw water system. What's not to like, right?

While keel cooling offers these advantages, it comes at a price. Most keel cooled vessels also utilize a dry stack, which must be incorporated into the vessel's design, along with supporting and insulating it, which can present significant challenges. Alternatively, a keel cooled vessel could utilize a wet exhaust, however, that entails pumping seawater into the vessel, which forfeits some of the advantages of keel cooling, although a heat exchanger still remains unnecessary. Because the keel coolers add drag, most keel cooled vessels are of the displacement variety. Keel coolers must be properly sized to properly dissipate the heat generated by an engine throughout its rpm range. Many installers underestimate the necessary surface area to accomplish this task.

Converting a conventionally cooled vessel to keel cooling is no small undertaking, and if it can't incorporate a dry exhaust, then the advantages are debatable.