

# June 2019 Newsletter

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## Photo Essay: Manual Tiller Steering

Steering, along with propulsion and watertight integrity, is one of your vessel's core systems, one that must be kept operational at all costs. Without these capabilities you are either adrift or sinking.

Steering systems on most small vessels fall into one of two categories, cable over sheave or hydraulic. While both can be made exceptionally reliable if properly designed, installed and maintained, failures do occur. Vessel operators should be prepared for such failures, for cable systems a spare cable/chain assembly, or at least the ability to temporarily repair a cable section using bulldog clamps, is a must. Where hydraulic systems are concerned it gets a bit more complex; spare hydraulic fluid is a must, while replacement hose sections and field-installed hydraulic hose ends, these are also comparatively inexpensive and easy to install, also make very good sense.

In the event a failure occurs, one that cannot be repaired at sea, a fall back option should be available; typically, this takes the form of a manual tiller. Most are designed to engage the rudder stock using a socket arrangement. For hydraulic systems a relief valve must also be installed, without it, it may be impossible to move a rudder without disconnecting the hydraulic ram, a task that could be time consuming and may leave the rudder with no stops and no damping effect. If installation of the manual tiller requires the removal of a deck access plate, make certain that the key required to do so is readily accessible.

In the image shown here, taken aboard a vessel I inspected,

the manual tiller does not fully engage the rudder stock. It's unlikely this tiller would work for very long.

If your vessel is equipped with a manual tiller, it should be tested, you should be able to have it operational in no less than three minutes; imagine you've lost steering while you are entering a narrow inlet, canal or cut, with wave action and wind. Time yourself, how quickly can you unship the tiller, remove the deck plate, engage the rudder stock and open the relief valve?

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## **A comment on Series and Parallel; What does it mean?**

I use a mnemonic to remember the difference between parallel and serial connections. Years ago I used to shop at a grocery store called Pac-n-Sav. So I remember that, and I remember that Parallel Adds Current -n- Serial Adds Voltage. Easy!

Donald Million

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## **Ask Steve**

### **Steve:**

I have a Cal 24 sailboat with only one battery that I use a trickle charger from a battery charger. I haven't sailed it in several years, and then really only during the day, so the battery by now is dead.

However, I'm thinking of a bigger project.

Some background:

Let's say I have a water wheel, and a permanent magnet generator (PMG) similar to an altered alternator which produces voltage from the water wheel.

This PMG based on wiring the rectifiers can deliver either 24 or 48 volts. The maximum RPM I'm guessing is 1200 rpm's delivering about 2000 watts.

Let's say I have four (4) 12 volt 100 amp hour batteries. I could wire these four batteries in several different configurations, e.g., parallel, series, and parallel series depending on what I need to achieve for output energy needs.

If I wire them all in parallel, I could have 12 volts with 400 AH

If I wire them all in series, I could have 48 volts with 100 AH

If I wire them in parallel-series I believe I could have 48 volts 400 AH

I believe you mentioned in your article that batteries like to be charged at a particular rate to achieve the longest life of a battery. I don't know how to determine what the optimal rate is, but here is my question....

Based on the three different wiring battery bank configurations above, does wiring batteries in the various configurations change the optimal charging of the batteries to maximize life expectancy, or does charging a bank of batteries regardless of how many batteries are wired and in which configuration they are wired not have anything to do with charging the bank, as charging a battery bank is determined by only the optimal charging rate of one single battery within the bank?

In other words, is charging a battery bank driven more by the optimal or desired charging rate based on one single battery

within the bank, or based on how the bank is wired in total.

I'm guessing that whatever the answer is to my above question will ultimately determine how to adjust the PMG, power sources, etc., to ensure it produces the desired charging rate to achieve maximum life for all batteries.

Thank you,

Ken

**Ken:**

In broad terms, battery banks are wired for the voltage required by the vessel, typically 12 or 24 volts, and then charged at that voltage. The required charge profile is established by the battery manufacturer, however, it's relatively standardized for flooded batteries, with some variations for specific brands of SVRLA (Gel and AGM) batteries. You should always consult the battery manufacturer's charging requirements, and then ensure your charge source, alternator, shore charger, solar panel, water generator etc., is delivering that profile using a dedicated regulator.

Battery charge profiles are typically measured in volts, while charge acceptance rates are measured in amps. A battery's capacity is measured in Amp-hours, which is simply amps delivered over time.

While there are some advantages to connecting batteries in series rather than parallel, to avoid voltage imbalances, it would be impractical to do so simply for charging purposes. Set the bank up for the voltage you need, sounds like 12 volts in this case, and thus paralleled 12 volt batteries, and then use and charge it in that configuration.

**Steve,**

We are working on a new 38' build and want to use PEX tubing for potable water delivery and for deck wash raw water lines. Though the tubing will run below decks, we have a concern about ultraviolet light exposure to the PEX since light may at times enter areas with the tubing through hatches, etc. I have been told that there is a significant risk of PEX failure if exposed to UV. If this is the case, is there a recommended protection system (e.g. painting the tubing)?

Tony Dean

**Tony:**

Most modern, medium to large production boats utilize PEX for potable water as well as heating and some chiller air-conditioning systems, and have for a number of years. I have yet to encounter many PEX failures, and as far as I'm aware none as a result of UV exposure.

Having said that, if exposed to sunlight PEX can degrade and fail, and this is true of most non-UV stabilized plastics. The exposure leads to embrittlement and eventually rupture.

In a document from Zurn, a large supplier of PEX plumbing, the issue is summed up as follows...

"Zurn PEX UV Resistance Like most plastic materials, PEX is subject to UV deterioration and must not be exposed to sunlight, either direct or indirect. Outside storage is not recommended, but if necessary, the tubing must be covered with a material that will protect it from UV light. Failure to do so will void the warranty. However, in the circumstance that a project is delayed, Zurn PEX tubing has UV stabilizers that are designed to protect the tube for up to 6 months. In this circumstance, protective measures should still be taken to limit UV exposure."

For applications where PEX is exposed to sunlight for an extended period, on deck or in a cockpit for instance, it must

be shielded or sleeved.

**Hello Steve:**

I am in my 2nd year of owning a 1985 Oceania 35 Taiwanese trawler (3rd owner). The boat is in Lake Ontario but has travelled to Florida twice over the years by previous owners. My question is, even though the boat is bonded, there is no anode on the stern of the hull. There are two anodes on the two drive shafts and two on the rudders and that's it.

I'm thinking of tracing all the green wires this spring to see where they end up. I do know they attach onto the diesels, but there are no anodes in the engines either. What to do? The previous owner kept a good log book, but no mention of issues.

Thanks for your help.

Barrie Marfleet

**Barrie:**

It's never a bad idea to trace, and inspect the wiring in a bonding system, especially aboard an older boat. Be sure to look closely at each one of the connections for corrosion and tension, all should be clean and tight. My protocol is to remove each one, make sure the ring terminal is in good condition, clean it and the attachment surface with a ScotchBrite pad, apply conductive paste such as T&B Kopr-Shield, make the connection, and then spray with a corrosion inhibitor such as CRC Heavy Duty Corrosion Inhibitor. You can check the integrity of the bonding system, using a multi-meter, while the vessel is hauled out. The maximum resistance between any anode, and any protected metal should not exceed one ohm.

As far as attaching anodes to the bonding system, it's essential if you want cathodic protection. I can't explain why the builder wouldn't do this unless they expected the rudder anodes (assuming the rudders are bonded as they should be) to act in this role.

Ideally, anodes should be included in the bonding system, these are typically installed on the transom. You can read more about bonding systems here <http://stevedmarineconsulting.com/bonding-systems-and-corrosion-prevention/>.

**Steve,**

Our 1979 Watkins 36 ac has an integral diesel tank in our keel.

We are doing an electrical conversion to the boat.

The only way to remove the tank would be to cut the keel off and rebuild it.

Any thoughts as to how to clean the tank for a shower sump? Or fill it with... something? (Foam...?)

As a professional that sells my time and knowledge I hate asking this but I just cannot find any info on this topic.

Thanks

Steve Thorburn

**Steve:**

Cutting the keel off to access the tank is definitely out, just in case there was any doubt regarding that option.

You don't mention the tank material, however, if it's metallic, steel or aluminum, then using it as a shower sump is

ill advised, as corrosion will undoubtedly become an issue. You could, however, install a dedicated non-metallic shower sump into the remnants of this tank, once you've removed the top.

In a case like this, the most effective means of dealing with a diesel tank involves cleaning it using a hot water pressure washer. The interior of the vessel should be masked/curtained off and negative pressure applied to this area during the cleaning process, to prevent diesel fumes or splatter from entering the cabin. If the tank is metallic, it should be emptied, and then gas-freed using compressed air, pumped into it for a minimum of 24 hours, to remove diesel fumes, after which cutting can begin. Solids should then be scraped from the tank bottom. Hot water pressure washers will emulsify and remove diesel residue; as the tank is being washed the waste water should be pumped out of the tank into a barrel. After being allowed to separate, the fuel/oil residue can be removed from the surface of the water and properly disposed of.

If the tank is steel the interior should then prepared for paint and coated with a two-part epoxy suitable for metal priming. Doing so will prevent it from rusting and eliminate any residual diesel odors. Coating the inside of a diesel tank, and ensuring adhesion, would be problematic only if the tank were to be placed back into service for fuel use. In this scenario, some paint adhesion failure, the result of traces of diesel left behind, would not be an issue.