July 2017 Newsletter

Text and photos by Steve D’Antonio

Photo Essay: Direct-Bearing Terminals

Shipboard electrical connections face a host of challenges, vibration, stress, extremes of temperature, and humidity or outright dousing with water. For this reason, they must be made in as secure and reliable a fashion as possible. Many believe this means soldering or using heat shrink terminals. Contrary to popular belief, solder is not only not necessary to ensure a good low resistance electrical connection; it can prove a detriment in that it stiffens otherwise flexible stranded wires. There are techniques for soldering that don’t compromise the connection or longevity of the wire; I’ll cover them in an upcoming photo essay.

Heat shrink terminals can be beneficial in two ways, one they make a more water resistant (but not water-proof) connection, and two, they provide strain relief to the conductor to terminal interface.

One wire termination approach that is strictly forbidden, at least where ABYC compliance is concerned, involves the use of what are known as ‘direct-bearing’ screw terminals, there the end of a screw bears directly on conductors as it’s being tightened. Direct-bearing terminals are frequently used in household and industrial electrical applications, and in that role they are acceptable because the conductors are either solid, or they are made up of just a few large solid conductors. Conductors used in marine applications must, to achieve ABYC compliance, be made up of many small strands,

affording wires and cables the requisite flexibility. When direct bearing terminals are used with stranded wiring, it often results in damaged conductors, high resistance, conductor separation, unreliability and potential overheating. In the accompanying image a direct-bearing screw terminal has been used in a critical application, this vessel's electronic shift and throttle control system. This terminal should be replaced using ring terminals and a terminal strip or butt splices.

Ask Steve

Dear Steve,

Your recent reply to Curt regarding replacing his PSS [PYI's dripless stuffing box] bellows every six years brings up an issue I cannot get over.

Having owned boats for 30 years with conventional drip stuffing boxes, I cannot understand why anyone would buy the PSS system.

It is high maintenance and introduces a new high risk of sinking your boat if the bellows fails.

Having spoken with the PSS people, and my yard guy, they tell me that they have never seen bellows fail.. My current boat a Sabre 42, has a receipt in the records from the previous owner… emergency haul out in the middle of the night for a failed bellows threatening to sink the boat.

Give me an old fashion stuffing box anytime.

Bruce Adornato

Bruce:

The subject of dripless vs. conventional stuffing boxes is a weighty one to be sure, and the controversy surrounding it is only slightly less fraught than choosing the right anchor.

The 6 year replacement interval is the stuffing box manufacturer's, not mine. I have seen a handful of dripless stuffing box hose failures (not necessarily PSS's), these are usually associated with water starvation, and then seizure of the bearing to the shaft, which then causes the normally stationary seal section to spin with the shaft. If you didn't see them, I recommend you read the two articles I wrote recently on conventional and dripless stuffing boxes, they are in the Marine Systems Excellence eMagazine archives, Conventional and Dripless. Interestingly, I've seen many more conventional stuffing box hoses fail, but I suspect that's only by virtue of their volume, there are far more of them out there.

Personally, I too prefer a conventional stuffing box, but that's almost certainly because I've disassembled, repaired, adjusted and repacked hundreds in my career, some under emergency conditions. Your comfort level with conventional stuffing boxes is also likely a result of your familiarity with them. I suspect many vessel owners, being unfamiliar with these, would rather have a dripless, and seemingly "maintenance-free" or low-maintenance alternative. The prospect of a dry bilge is also enticing to many. Having said all that, there's no doubt that catastrophic failures of conventional stuffing boxes are rare. Again, refer to the above-mentioned article for the various pros and cons of each.

Steve,

I just read an article you wrote on installing a vacuum gauge on a Racor filter. In my case we have a Yanmar 50hp Diesel engine on our sail boat. I installed the gauge by removing the

‘T’ on top of my Racor 500 filter. It has worked well for the past two years but now after the last filter change I am not getting any sort of vacuum reading, even at full throttle. There a small yellow flip valve (?) atop the gauge with an ‘on’ ‘off’ label. Regardless of which way it is pointed I.e. On or off I’m not getting any reading on the gauge.

Any suggestions?

Thank you,

Frank Tedeschi

Frank:

The fact that you see no vacuum reading, even at full throttle, isn’t unusual, it simply means the filter is clean and you have no restrictions. Most systems run at 0 vacuum until the filter begins to get restricted with the debris it’s catching. You can test the gauge, to confirm it’s working, albeit not its accuracy, by slowly closing the fuel supply valve to the engine (provided it is between the tank and filter) while it’s running, as you do so you should see the needle on the gauge begin to climb. When you do, re-open the valve; the needle should drop back to 0.

The yellow valve at the top of the gauge is used to open the gauge to atmospheric pressure, for equalization purposes. With changes in barometric pressure and ambient temperature, the gauge can develop internal pressure or vacuum, which will affect accuracy, and which is released by opening this small valve. Leaving it closed prevents dust or water from entering the gauge, although I believ eit’s safe to leave it opened.

As an aside, I’m no fan of the T handle replacement vacuum gauge installation approach. This arrangement means, as you’ve discovered, that the gauge must be removed every time you service the filter, subjecting it to potential damage or shock. You’ve also forfeited the convenience of the T

handle. I'd rather see the gauge permanently installed on the filter's outlet plumbing, as is shown in this article http://www.proboat.com/the-vacuum-gauge-tool.html

Steve,

I'm looking at small trawlers, Nordic Tug 34 and Mainship 34 as examples, because they are fuel efficient at displacement speeds. Yet, they come with large engines for planning. Can these engines be operated at displacement speeds/ lightly loaded for prolonged periods without harming the engines?

Enjoy your articles, many thanks.

Ron Norton

Ron:

Thanks for the note and query on under loading, and I'm glad to hear you are on the hunt for an efficient trawler. This question comes up very often (it's one I've responded to in the Ask Steve column previously as well).

In short, where possible chronic under-loading should be avoided (ultimately, the best way to avoid this is by not over-powering boats with engines that are too large), regardless of what boat manufacturers, dealers and brokers may say. While it's true that newer, electronically-controlled engines cope with under loading better, they are not immune to the harmful side effects that result from running for extended low load operation. On the bright side, there are methods to mitigate the harmful effects of chronic under-loading, some of which are detailed in this article, http://www.proboat.com/why-you-shouldn-t-go-easy-on-a-diesel.html, one of several I've written on this subject.

Hi Steve,

Thank you for sharing your wisdom and knowledge in your emails and FB posts. I read all of them religiously!

What is your take on marine DC generator? In about a year or so, we want to start a circumnavigation on 55′ to 60′ sailboat. It will have many of modern life's conveniences, A/C, washer/dryer, water maker etc. Because of a worldwide trip we will be confronted with 50 Hz and 60 Hz marinas. What are your thoughts on having a large battery banks with a large DC generator and running everything, including AC devices off the batteries with one or multiple inverters. One could be for 240v/50 Hz the other could be 110v60hz. For shore power we could use a 110-300v 50/60 Hz charger to top off the battery. For now my estimate is that I would need about 10-12KW generator or maybe 2 smaller one for redundancy.

In doing some preliminary research, I found many comments stating that while the DC approach makes a lot of sense, it is a lot more efficient, the AC and is best approach for worldwide usage, many mentioned that marine DC generators are not very reliable because there is no large market for them.

Any thoughts?

Thanks a bunch!

Daniel Wolff

Daniel:

The DC option is a very enticing one, for a variety of reasons, not the least of which is efficiency, many onboard devices (including and especially your battery bank) are already DC, so there's no conversion, with the resultant loss and inefficiency, from an AC genset to DC for battery charging. Today, inverters can supply virtually any amount of power desired, limited only by the size of the battery bank

and one’s budget. Sophisticated inverter packages can supply 120/240 volts, as well as power sharing, in which they can boost low or inadequate shore power.

What you’ve heard about DC generators is at least partially true, there aren’t many being made when compared to AC generators, with the resultant drop in reliability that comes with small production runs; there have been reliability problems with some of the brands that are on the market, and most are not readily adaptable to your voltage regulator of choice, which means you are stuck with the genset manufacturer’s charge profile.. You can still take advantage of the DC and inverter system, without the DC genset, it has many advantages, particularly for vessel’s traveling outside North America. If you install a stand-alone charger(s) that has a wide input range, 90-250- volts, 50/60 Hz, it can be used to charge batteries while on shore power, which in turn will power your AC appliances via your inverter bank. I have several clients cruising aboard trawlers, internationally, using exactly this arrangement. If you want to be able to power air-conditioning and washer/dryer, the inverter size will need to be able to accommodate these loads and their start up surge. Some refer to this is a poor man’s frequency converter. While costly, it’s still less than a dedicated frequency converter, and more versatile. Victron and Mastervolt offer some useful literature on the subject.

Your biggest challenge with this system will be low shore power current supplies, in much of Europe it will be 8 or 16 amps at 230 volts. Still, this can be used to charge batteries, which will act as a buffer when loads are high and shore power can’t keep up. At low load times, the batteries will be recharged. A DC genset would complete this package, if you can find one to suit your needs, however, a mass-produced genset can also fill this gap, as well as affording you AC power production redundancy in the event of an inverter failure.