August 2017 Newsletter

Text and photos by Steve D'Antonio

My Love/Hate Relationship with Bilge Pump Control Panels

While it's often given short shrift, bilge pump design and installation is every bit as important as propulsion or steering. The system must work properly and efficiently, all the time. A single failure can lead to costly damage or the loss of a vessel.

For this reason, I carefully scrutinize these systems aboard every vessel I inspect and sea trial. In addition to the pumps and their installations, control and annunciator panels play a critical and often overlooked role in bilge pump applications.

Among other things, every bilge pump installation should include a visual indicator of pump operation, i.e. whenever the pump is running a light is illuminates. Times have changed, the bilges of a modern vessel are for the most part dry, so it makes sense to include an audible annunciator for any bilge pump operation, rather than just high water. If a pump runs, a not unpleasant chirp or buzzer should sound, while flooding would sound a louder and impossible to mistake alarm. Additionally, the manual position in the familiar AUTO OFF MAN switch should not be spring-loaded or momentary-on, you should be able to turn it on and leave it on. If the float switch fails during a flooding episode, it shouldn't be necessary to have someone man the switch to keep the pump running. On a similar note, it *should* be difficult to inadvertently turn a bilge pump switch off, ideally switches should be protected or covered.

The switches in the accompanying image are spring-loaded in the manual position, and they are exposed, making it more likely that they could be inadvertently turned off, particularly where they are located, adjacent to the engine key switch and trim tabs. On a positive note they are equipped with indicator lights, however, in the bright sunlight of a flybridge, which is where these are located, it's unlikely they'd be noticed, making an audible annunciator all the more valuable.

Ask Steve – August

Hi Steve,

I just read your helpful article on galvanic isolators in PassageMaker Magazine.

Would a good inverter do the same as a galvanic isolator?

If using a galvanic isolator, can both 50 amp shore power cords run through one isolator or do you need two?

If not, could an inverter on one power cord and an isolator on the other one work?

Thanks!

Dave Mckusick

Dave:

You've posed a good question. Unfortunately, inverters, when in bypass mode, where shore power is passing through them, do not, and cannot, isolate shore and vessel ground, and therefore would not provide isolation from galvanic current.

You can obtain galvanic isolators rated for 100 amps, through which both 50 amp shore power cord safety ground wires may be routed. Therefore, yes, you can use one isolator for two 50 amp services, however, do check pricing as a single 100 amp galvanic isolator may cost more than two 50 amp units. Whichever unit you choose make certain it meets the latest (2008) ABYC revision for this standard.

Hi Steve,

We have a question about running our diesels. We have an Azimut 46 with twin Cat 3208's 435 hp. WOT is around 2800 rpm. We do about 28-29 mph. We usually cruise around at about 1000 – 1200 rpm unless we want to get somewhere then we run up around 2000 rpm. Fuel economy for the last 57 hours was about 4 GPH which is great.

Our question is: Is there any problem running the engines at lower RPM's vs. the 1800 – 2000 rpm. Does it put more wear on the engine at lower rpm's? Engines are in great shape with only 490 hours and doesn't burn any oil.

Thanks,

Dan Woodworth

Dan:

If I had the proverbial nickel for every time someone asked me this question. Seriously, it's a good question and I'm glad boat owners are more and more conscious of chronic under loading and the issues it can cause. I've written a few columns on this subject, and this give me a good opportunity to reiterate my thoughts.

I recently read a boat review in which the reviewer boast that, because the subject vessel achieved cruising speed while using only a fraction of the engine's available power, the engine should therefore last “forever”. It’s a concept that’s commonly misunderstood, and one that seems counter-intuitive, the lighter the load on your engine the greater the likelihood of developing problems. It’s true, when a diesel engine is chronically under-loaded several phenomena occur that conspire to shorten the life of the engine and increase the need for maintenance and possible repairs.

The environment inside a diesel engine combustion chamber is a hellish one indeed. The temperature can reach over 1000°F while the pressure may be many times that of the atmosphere outside the engine. Interestingly, however, this is how a diesel engine is designed to operate, at comparatively high temperature under relatively high load. The high pressure found within the combustion chamber represents the very philosophy of the diesel ignition process, compressing the air increases its temperature, which in turn enables it to ignite the subsequently injected fuel. Ideally, a diesel engine should be loaded beyond 50%. When operated in this manner the temperature within the engine ensures efficiency and longevity. Contrary to popular belief, while they may have improved defenses against it, new, electronically controlled engines are not immune from issues created by chronic under-loading.

When discussing proper operating temperature it’s important to remember that there are several regions within the engine, all of which may be operating at different temperatures under differing load conditions. For instance, when you start your engine and run it at idle or at low rpm you may notice that the temperature gauge, it’s measuring coolant temperature, doesn’t move very much. If it’s graduated in numbers as it should be it’s unlikely that the needle passes 140°F. When a load is applied, on the other hand, if you are motoring hard to make port before a weather systems descends upon you, then the needle should hover around the engine’s maximum design operating temperature, which for closed cooling system engines is typically between 160°F and 195°F. In the light load condition, when the coolant temperature is low, it means the temperature of the combustion chamber is also lower than that which is optimal and this leads to the formation of excess soot or carbon, which is deposited on the piston rings, injectors and valves, a scenario which reduces efficiency and may shorten the life of these components. Cylinder wall glazing which exacerbates blow by, also occurs when an engine is chronically under loaded, especially early on in its life. Because they are often chronically under loaded in the critical break in period, the first 50-100 hours, generators are notorious for suffering from this malady. Even under moderate load, when the coolant reaches a normal operating temperature, unless the engine is equipped with an oil cooler thermostat, the oil temperature often remains cooler, too cool for optimum operation. This is a significant and often overlooked aspect of under-loading. Few engines are equipped with an oil temperature gauge; however, you can measures yours my "shooting" the approximate vertical and horizontal center of the oil pan with an infrared pyrometer.

The consequences of running an engine with "cold" oil are an increase in sludge and varnish production within the oil as well as an inability for the oil to vaporize water that accumulates as a result of piston ring blow by, which itself is exacerbated by the aforementioned carbon formation. Blow by is essentially combustion chamber gasses "leaking" past the rings into the crankcase, a small amount of which is normal, carrying with them some water that's part of all diesel exhaust. Whether the blow by is normal or excessive, the water can only evaporate when the oil gets hot, over about 160°F. Sludge is a combination of water, carbon and other contaminants, it impedes oil flow and, as the name implies, it's greasy and often brown or tan in appearance, while varnish is a precipitate that is much harder, like, well, varnish, it adheres tenaciously to metal surfaces within the engine. Both of these contaminants are harmful to an engine as they starve vital components of lubricating oil. The bottom line is, avoid chronically under loading your engine and, if you must do so, run it up to 75% load for 10-15 minutes out of every four hours to stem the sludge, varnish and carbon tide and perform oil analysis with each oil change. The former will increase oil and combustion chamber temperature to preferable levels, thereby reducing build-ups, and the latter will alert you to contaminant related issues caused by under-loading before they become critical.

Steve,

I have a question that I hope you haven't answered already.

I am anticipating having some work done on my boat this winter, located on the hard in the Philly area. Covered but no shed.

This will include removing center fuel tanks, and installing a house battery bank in that area. This work will also include rewiring the 3 way switch and adding an isolator.

I'll also be adding a Glendinning synchronizer for Ford Lehman 135 engines.

I don't know what if any impact this might have on the hull or parts involved and wanted your input on any issues that could arise with respect to the fiberglass or parts and if so what I should look out for or whether you think work should be held-off and done in the spring?

As always, thanks for what you do and the help you provide to boaters everywhere.

Best regards,

Charles Williamson

Charles:

Adding a battery bank, one that’s replacing a fuel tank, along with the other electrical and engine tasks, can encompass a wide range of options, making it somewhat difficult for me to anticipate the variables. Having said that, those carrying out the work should agree to do so while meeting guidelines set forth in ABYC E-10 Storage Batteries; E-11 AC and DC Electrical Systems; H-33 Diesel Fuel Systems and P-4 Marine Inboard Engines and Transmissions. Needless to say, those carrying out the work should belong to ABYC and, ideally, hold an electrical certification.

Carrying out these tasks during the winter shouldn’t play a significant role unless fiberglass work will be done, in which case the vessel will needed to be both heated and ventilated.

Steve,

I have a 2007 SeaRay 40 MY that I cruise along the St. Lawrence River and up the Rideau Canal and Trent-Severn Waterways.

After a recent holiday in Montreal we departed the Old Port only to find our engines overheating badly. It turned out that I had left the 2 seacocks closed which supply cooling water to the engines. Opening the seacocks failed to solve the problem because the impellers had been completely destroyed. After a rescue by the Coast Guard, we were able to replace the impellers (with our spares) and resume our travels. We noticed, however, that there continues to be a burning rubber smell in our aft bedroom while we’re underway.

Is it possible that the exhaust hoses have some rubber parts that have now been fried on the inside? And might these pose a risk of fire in the long term?

Thanks for all the great advice you provide. It's comforting to know that there are independent experts to turn to when things go wrong.

Dr. Mike O'Connor

Michael:

A failure like this is a heartache and all too common, boat owners make this understandable error very often.

Depending on how long you ran, and under what load, you almost certainly did some damage to the otherwise wet exhaust system, which is made up of fiberglass and rubber components. These aren't designed to operate at much over 200° F, while dry exhaust can approach 1000° F; it doesn't take long for it to do significant damage to these parts.

I don't believe there's a risk of fire, however, there is a risk of flooding and fume ingress, if these "soft" parts have been overheated, they could leak both water and exhaust gasses into the cabin. The entire run, end to end, should be inspected for heat damage.

While it is little consolation to you now, the entire episode could have been avoided if the exhaust system had been equipped with a temperature alarm, these are readily available, inexpensive and mandated for ABYC compliance. I wrote about them in this article http://stevedmarineconsulting.com/onboard-alarms-part-i/. I strongly recommend you fit a set to avoid a re-occurrence.