



The Professional Captain

Engine Room Quick Check for Inboards & Generators, Part II Everything you always wanted to know, and were afraid to ask By Captain Don Fleming

It is now late October as I sit at my desk to put a few last finishing touches on this second and final part of this month's article on Inboard Engine Quick Check Procedures. The spectacular autumn foliage has recently reached its peak and a few recent blasts of what feels like frigid Northern winds have already given us some clear indications of what is to come. It seems like more than just a coincidence for me to be polishing the last segments of my column tonight because I just finished spending the better part of the afternoon today crawling around the engine spaces of a client's 46 foot Grand Banks trawler in preparation for a delivery down to Norfolk, Virginia scheduled for later this week. While considerably more time was spent checking and performing routine maintenance tasks for this over 400 nautical mile voyage, I bund myself following my own advice and procedures as outlined in this two part article, and I was reminded once again of how much easier it is to get prepared beforehand by making these thorough checks than to have to deal with an "emergency" while underway.

So without further adieu, let's pick up where we left off last month when we discussed checking vital fluids, engine cooling systems, and the fuel system. As we did last month, the single page [CHECKLIST FOR INBOARDS AND GENERATORS](#) is printed as a handy reference guide at the end of the article. If you happened to miss last month's opening discussion and are interested in having the complete explanation, call or write Jack Krasko at the paper, and he will be happy to send you a reprint.

CHECKING THE "VEE BELTS":

After you have checked the fuel system the next logical step as long as you are already at the forward end of the engine is to check your "vee" belts for proper tension and wear. Most boats have between two or three "vee" belts at the front of the engine to drive various components, such as the all important alternator. Proper belt tension is about 1/2 inch of play, and this can be measured by twisting the belt 1/2 turn (180°) with your hand. Proper tension is especially important with regard to the alternator which will not charge the battery properly if the belt is slipping even slightly.

It is well worth the effort to tighten the tension of the belt, if it is needed. This is a fairly simple procedure that involves loosening a few bolts, usually one at the base of the alternator where it is connected to the engine block, and another at the arc-like rotating arm on the opposite end of the front of the alternator. Once these bolts are loosened, take a pry bar, or another fairly long steady object like a very large screwdriver, and place it between the alternator and the engine block. Apply moderate pressure to swing the alternator out a bit along the arc. It helps if someone can hold the pry bar in place for you as bolts are re-tightened. Re-check the tension by giving the belt a 1/2 twist and re-adjust, if necessary. Over tightening of the belts is to be avoided as it will create excess wear. Also, it is a good idea to carry extra belts and know how to replace them as this simple procedure can save a considerable amount of time, expense, and inconvenience.

If you have checked the belt tension and all is well, spend an extra few seconds checking for wear. Look at the areas where the belts turn around the pulleys to see if much "belt dust" has accumulated on any nearby bulkheads, stringers, or floors, etc. If the belts are not running true around the pulleys, this black rubber "belt dust" will be a sure sign of excessive wear.

CHECKING THE BATTERIES:

The next item to check is the batteries. Open them up by removing the plastic caps on top and see if the water level is low. It is best to fill them with distilled water because the metals in ordinary tap water contaminate the battery acid and reduce the life span of the battery. If your boat is being charged at the dock by a constavolt, you should expect to have to top up your batteries once or twice per month. Boats will tend to need much more battery maintenance checks than automobiles because boat batteries are being re-charged by the constavolt whenever there is a drain on them due the use of 12 volt equipment operated at the dock while the engines are not running. In a car, the 12 volt equipment is usually not operated unless the engine is running so that the alternator on the engine can do the re-charging. Because the water in the batteries is converted into hydrogen and oxygen gas during the charging process, the additional dockside charging by the constavolt causes more water to be used up.

Also check the battery terminals to see that they are free of corrosion and tight. Loose and/or dirty terminals can severely effect the entire electrical system so do not overlook this simple and easy check. Finally, be sure that all spark prevention terminal guards; battery, box covers, etc. are properly secured.

CHECKING THE BILGE PUMPS:

After you have checked the batteries, the next step is to check the operation of all bilge pumps and float switches in the boat. These pumps are your first line of defense should you start to take on water. You want to be sure that you know not only the exact location of each one but that each is working properly. I still agree with an old friend of mine, Scot Kurner, who circumnavigated the world with his wife, Kitty, in a 30 ft. sailboat back in the early 70's. Scott, who capsized and rolled completely over during a hurricane off of Cape Hatteras on his return voyage, maintained that on a small craft, the best bilge pump is a frightened person with a bucket.

I also have to admit, however, that electric and mechanical bilge pumps are good back ups. Checking electric bilge pumps is a simple matter of lifting the float switch next to the pump and listening for the sound of the pump going on. The float switch and the pump can burn out at times if a piece of debris gets caught under the float keeping it lifted in the "on" position and the pump remains on long after the water has been pumped out. Some float switches have a plastic guard over them to prevent this from happening, but I like to remove the guard and lift the float just to be sure everything is in working order. Manual bilge pumps, if they are installed for emergency back up, should be pumped a few times and the overboard flow and internal lines should be checked for leaks and/or loose clamps.

CHECKING THE TRIM TAB HYDRAULIC RESERVOIR:

Another item that needs to be checked is the trim tab reservoir. Medium sized boats often have the same unit that smaller I/O boats use. The fluid to be used in 99% of the cases is Dextron II, better known as automatic transmission fluid. The pump and reservoir are a self-contained unit and they are often mounted on the inside of the transom wall which may be in the after stateroom behind the aft bulkhead in a motor yacht, or on the aft side wall of the engine compartment in a boat with the engine compartment under the cockpit floors. They can be tricky little devils to find on some boats and nearly impossible to reach to fill on others. They can always be located by tracing the thin black hydraulic lines coming through the transom from the trim tabs to the pump reservoir unit. Many of these units have a translucent reservoir so you can check the fluid level by shining a flashlight on the side of the tank while looking at the front face. The fill plug is usually very small and is often under a clear tinted plastic cover sitting on top of the unit. Remove the screw on top of the cover and lift the cover off to get to the fill plug. It is helpful to have an extremely small diameter funnel to pour the fluid into the fill hole.

CHECKING THE STUFFING BOX:

The prop shaft stuffing boxes, which allow the spinning shaft to pass through the hull without excessive leaking, can be located by tracing the prop shafts from the back of the transmissions to the point where the shafts exit the hull. On medium sized boats, they are usually only a foot or two away, but on larger boats with center engine rooms, they may be as much as a few staterooms aft under some access hatches in the floor. The unit is adjusted by removing the safety lock cotter pins and turning the collar on the shaft end toward the stationary sleeve on the aft end of the assembly. There are various types with many using two locking nuts on the shaft end instead of the cotter pins illustrated here. Regardless of minor difference, they all work the same in that the tightening of the shaft collar puts pressure on the fibrous packing material in the aft end sleeve slowing down the water flow leaking in along the prop shaft. Proper tightening of the assembly will allow a drop of sea water to slowly drip out of the shaft end of the unit every second or two. This dripping water helps to cool the shaft as it spins, so avoid over tightening the shaft collar as this may warp or scar the shaft, or will at least wear out the packing material at an abnormal rate. This is a simple procedure that should be done only when the stuffing box is leaking at an abnormal rate. If tightening the collar all the way does not stop the excessive leaking, then the packing material has to be replaced and that procedure is beyond the scope of our Quick Check discussion.

CHECKING THE STEERING SYSTEM:

A very important, but often overlooked item to check is the steering system which takes a tremendous amount of strain in rough conditions. Better to find a fault and correct it at the dock than to lose the boat's steering ability when you least expect it. Most modern twin engine power boats have hydraulic steering systems, and they are three common types: Teleflex, Wagner, and Hynautic.

The Teleflex and Wagner systems have their reservoirs right on the steering column directly behind the wheel. The Hynautic has a pressurized tank usually located either in the engine room, or on the inboard side of the transom. With the Teleflex and Wagner systems begin by opening the fill cap on the reservoir and checking to see if the reservoir is full. The Hynautic tank has a window in it to check the level. If it needs to be filled, remove the cap on the top of the tank to fill it. Once the cap is replaced, the system will have to be re-pressurized with air until the meter on the tank reads approximately 30 psi. This is usually done with a small bicycle tire pump. As always, be sure to fill only with the manufacturer's recommended fluid as rates of expansion at various temperatures must be taken into consideration.

After you are sure the system is topped off, and if necessary re-pressurized, have someone turn the wheel separately at each steering station and check the hydraulic lines and their connections for leaks, tightening fittings as necessary.

Next, check the mechanical steering gear that the hydraulic lines lead to in the stern of the boat to make sure all connections are tight and that there is free movement of all connecting arms and rudder posts. Also, check the rudder post stuffing boxes which look just like the prop shaft stuffing boxes, but sit vertical rather than horizontal as they come through the hull at the rudder posts.

If the boat has cable steering, check the run of the cable for cracked strands and excessive wear. Also check the tension of the cables and the alignment of the cable as it runs through the various turning sheaves, as this is an area especially prone to wear.

CHECKING THE GENERATOR:

Treat the generator as you would treat any other engine in the boat as far as the Quick Check is concerned. Because it is usually off by itself, sometimes in its own separate engine compartment, most people check the generator separately from the main propulsion engines. On larger yachts there will likely be two generators to spread the work load and allow for routine service without having to shut down the boat's entire AC system. Regardless of the set up, use the same procedures outlined throughout this entire two part article to complete the following checks: oil level, fresh water coolant level, cooling hoses and clamps, wiring, raw water intake system with its seacock and sea strainer, and the fuel system including the transfer manifold.

After you have completed these checks, start it up and check the exhaust system for leaks as the engine warms up. It is a good idea to also check the overboard discharge for the exhaust to see if there is a sufficient amount of raw water being pumped out with the exhaust gases. This is a good double check to see that the seacock is opened all the way. After it has warmed up for a few minutes, put a load on it by switching over to some of your heavy amp drawing AC devices like the refrigerator, air conditioning, battery charger, etc. Most engines work better when they are operating under the type of work load they were designed for, and the generator is no exception.

CHECKING MISCELLANEOUS ITEMS:

As we get near to the end of our checking procedures, you will now want to check various items to see that all connections are tight and secure. Start with each engine's cooling hoses by inspecting hose clamps and condition of the hoses. It is a good idea to squeeze each hose to get an idea of how firm each one is under normal conditions. Check for small cracks and wear as you move from hose to hose. Tighten any loose clamps. It is also a good idea to carry an extra set of cooling hoses on the boat so that you can replace one, if it should blow while underway. In addition, you may also want to carry some extra raw wafer pump impellers to replace if needed. The procedure for this, however, is beyond the scope of this present article.

Check your throttle and gear shift linkages by having someone move the dash board controls as you look for loose pins and connectors. Also check to see that the moving parts are properly lubricated with ease. Check the wiring on each engine to see that all connectors are tight and secure. Check the hoses of the blower fan to be sure that there is an unimpeded run from the bottom of the bilge out to the exhaust grill on the side of the boat. Look for cracks and cuts in the hose, and tighten any loose clamps. Check all thru-hull fittings for electronics like speedometers and depth sounders for leaks.

When you are satisfied with all other checks, or heifer yet, when you are nearing the last five minutes of your routine, start the blowers to ventilate the engine spaces. After checking to see that the spaces are properly ventilated, start up the main engines and check your exhaust system for leaks as they warm up. At this time you may also want to double check your fuel lines and cooling hoses for any previously undetected leaks. Remember that it is a good idea to wear a hearing protection device while working in the engine spaces with the motors running.

What did he say?

He said, "It's a good idea to wear hearing protection."

What?

A FINAL WORD ABOUT OVER ZEALOUS ENGINE CHECKING:

As you follow the procedures outlined in this two part Quick Engine Check discussion, you may come across some slight oil leaks on various engine components. Diesels are especially notorious for weeping or leaking small amounts of oil through their gaskets and seals, especially before they're fully warmed up to proper operating temperatures. I would be very reluctant to tighten any engine bolts except in cases of severe leaking or other serious problems, and then, I would tighten very moderately. There is a much greater chance of causing far greater damage by snapping off or stripping an engine bolt by trying to get rid of a small annoying leak that would be better off left alone. The danger of disturbing a slightly damaged gasket or some of the newer lightweight aluminum alloy engine parts is very great, if one does not have proper training. So the word to the wise is don't overdo it! Another word to the wise is "If it works don't, fix it!"

CONGRATULATIONS AND THANK YOU:

You have now completed a very thorough engine room quick check. By following this procedure each time before you go out, you will have more confidence in your boat because you will be less anxious about mechanical failure. Your family and guests will also feel much safer and secure, knowing that you have checked to be certain that all systems are GO. Of course, on longer trips, periodic checks of the boat's systems are necessary, and often an engineering log is kept to record these checks in a simple and straightforward manner, but, that is the subject of a future article.

Before concluding, I would like to again express my appreciation to the wonderful people at Charles Point Marine in Peekskill, Mike and Ginny DiForio and their staff who allowed me to poke around and photograph their outstanding new 24 ft. Formula 242 SS Sun Sport and their new 36 ft. Formula Performance Cruiser. These are truly great boats that I have operated first hand on numerous occasions during deliveries and hands-on training session with their proud new owners. I would also like to again thank their ace mechanic, Bobby Tencza, for providing some very valuable technical expertise. If you have not visited their beautiful marina complex, I would highly recommend it to you. Mike and Ginny would be happy to show you through' a new Formula or to have their experienced, friendly staff provide you with any of a number of marina services. Stop in and say hello next time you're cruising in the area.

*Captain Don Fleming is a licensed USCG Operator with over 25 years experience in sail and power vessels up to one hundred tons in both local area as well as ocean voyaging and racing from Maine to Grenada. He is well known throughout the area for his hands-on training programs that range from close-quartered docking and maneuvering to navigation, electronics, and ocean passage making skills. Questions or inquiries to Captain Don may be addressed to: Don Fleming Yacht Services Inc., 506 Eagle Bay Drive, Ossining, N.Y. 10562 914-941-3998.
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