



The Professional Captain

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

As the title of this month's article implies, here is the promised follow-up of last month's article on Inboard/Outboard checking procedures. The good news is that there are certainly more similarities between these two different types than there are differences. After all, the inboard part of an I/O is an inboard and the outboard part will be replaced with a transmission and prop shaft, but the checking procedures for these items are not terribly complicated. In addition, although the mystifying world of diesel engines is somewhat less familiar to the average reader than their gasoline counterparts, the checking procedures for a "Quick Check" on diesel engines are again, not much different from those used on gasoline engines.

As I did last month I will discuss each item in detail in order to give a good understanding of not only what to do and how to do it, but also why it should be done. It may seem more complicated than it really is at first, but if you take your time in the beginning and follow the article, you should be able to run through this "Quick Check" in about 15 minutes after you are familiar with the routine. Also, an **ENGINE ROOM QUICK CHECK LIST** will be included at the end of the entire discussion as it was last month that you can cut out, laminate it and keep it on the boat for a handy reference guide.

For the purposes of this discussion, I will be assuming a twin inboard engine configuration and an auxiliary generator. Also under consideration will be the various components of the somewhat more complex inboard engine room, such as prop shafts, steering systems, stuffing boxes and the like so that a thorough and complete check of all necessary systems will be accomplished. As I stated last month, I always include an explanation and hands-on demonstration of these procedures in my own training sessions, and it is these same "tried and true" methods that I am passing on to my readers.

The procedures repeated nearly word for word when the same explanation applies. This is done for the benefit of the inboard owners who for some strange reason might have skipped last month's article and so that this discussion is complete unto itself, avoiding cumbersome references back to last month's discussion of inboard/outboard procedures. Also, because of the need to be thorough and complete, this discussion will be divided into two separate sections, with Part I appearing this month and Part II finalizing this discussion next month in the November issue.

THE RATIONALE FOR THE QUICK CHECK:

Going through a routine engine room quick check procedure at the beginning of the day can prevent many difficult, costly, time consuming and dangerous developments from ever happening in the first place. You do not have to be a trained mechanic to do it properly. You can use your common sense, look for the obvious, and check the necessary by simply reading this article and following the procedures step by step until they become second nature.

GETTING STARTED:

As you enter the engine room, your first procedure will be to check fluids. The first and most vital of all fluids is your engine's oil. Locate the dipsticks and check the oil levels making certain that you hold the tips of the dipsticks down so that the oil does not flow up the stick giving you a false reading. The difference between "Full" and "Low" is usually one quart on a typical V-8. Be sure you add the manufacturer's suggested type and weight of oil by checking in your owner's manual and/or with your marina service manager because considerable damage can be done by using the wrong oil. It pays to tint the correct type and stock up on a few quarts. The industry standard use to be 30W motor oil, high detergent for gasoline engines, but manufacturer have been recommending a variety of: multi-weights, recently, so it is especially important to check if you have a late model boat.

A word of extreme caution is necessary, regarding the use of oils for diesel engines: never add gasoline oil to a diesel! The American Petroleum Institute (API) classification designates the letter "C," which stands for compression ignition, as diesel engine oil, and the letter "S," for spark ignition, as gasoline engine oil. These letters are followed by another letter which determines the additives the oil contains. Added to the lettering system is the Society of Automotive Engineers (SAE) number which indicates the weight or viscosity of the oil with the higher numbers indicating heavier weight for "thicker" oils. Further complicating the picture are oils like CD II which is the common oil for two cycle diesel engines like Detroit Diesels. With the ever increasing developments in multiweights and special additives, you do not want to end up destroying a 30 to 50 thousand dollar engine like G Detroit 1A.2V92Ti turbocharged diesel. Therefore, it might be worth while to check the owner's manual or your marina service manager and to read the label on the oil container carefully before topping off.

CHECKING THE FRESH WATER COOLING SYSTEM:

Next, if your engine is fresh water cooled, you will want to check the coolant level at the radiator type pressure release cap that sits on top of the heat exchanger, which is usually at the front of the engine. Be sure to fill with a 50 to 50 mixture of water and antifreeze. Many skippers make up the mixture ahead of time and store it in a plastic jenny can in order to save time. Be certain to tighten the radiator type pressure release cap evenly and securely to prevent the engine from over heating severely and blowing

off all your coolant while you are running. Some people prefer to check the small plastic expansion tank that is often connected to the heat exchanger just below the cap by a small clear plastic tube. If the tank has coolant in it and the tube also has fluid at its lowest bend, which should loop below the cap by a small clear plastic tube. If the tank has coolant in it and the tube also has fluid at its lowest bend, which should loop below the expansion tank so that a siphoning effect is maintained to the heat exchanger, then there is sufficient coolant in the engine. Some people prefer the old fashion method of opening the cap and sticking their finger in the heat exchanger to feel that the coolant level is up. To each his (or her) own! Of course if your engines are raw water cooled, you obviously get to skip this entire step.

CHECKING THE TRANSMISSION FLUID:

The next fluid to check is the transmission fluid. On larger boats the dipsticks for each engine's transmission are usually both placed inboard so that they can be easily reached from the center aisle between the two engines. On medium sized boats the dipsticks are usually placed on the same side (port, for example) on each engine's transmission making one inboard and easy to reach and the other outboard and difficult to reach. I mention this because some transmissions, like the ones on the larger Mercruisers, have what appears to be two dipsticks per transmission. The larger of the two is in reality the opening for the transmission fluid filter and the smaller is the actual dipstick. Again, be sure to check your owner's manual for not only the proper oil to use, but also whether or not the oil level should be checked with the engine running and the boat in neutral or not. Some transmissions must have the oil circulating into the entire transmission system before a true oil level can be determined. Congratulations! You have now checked all your main propulsion engine fluids. It may sound like a great deal now, but as I mentioned earlier, it will only take a few minutes once you are use to it.

CHECKING THE RAW WATER INTAKE SYSTEMS:

The next item to check is the raw water, or sea water cooling system. The system consists of a thru-hull fitting, seacock, sea strainer, and hoses. It allows the raw water to enter the boat from below the waterline and cool the engine either directly, as in raw water cooled engines, or through the heat exchanger in fresh water cooled engines. The first item to check is the seacock, which is the opening and closing lever located on the floor at the thru-hull fitting

All seacocks work the same way. When the handle is parallel to the pipe, it is open; when the handle is 90° to the pipe it is closed. First, check to make sure the raw water intake seacock is open. It is a good idea to work it open and closed so that it doesn't "freeze" in the open position, but make sure you leave it open! This may seem obvious, but you would be surprised at the number of engines that are seized up due to severe overheating because no one checked to make sure the seacock was open. Because of their location on the floor, they can easily get stepped on or accidentally pushed shut with someone's foot while they are stretching to reach some out of the way area in the engine room. It is important to locate and memorize the location of every seacock and thru-hull fitting throughout the boat because these are your emergency shut off valves in the event that a hose or hose clamp fails and raw sea water starts flooding the boat! It is a good idea to buy or make a set of tapered soft wooden dowels sized to fit in each thru-hull fitting and to tie this tapered dowel in place with a light line right at the base of the seacock. This way, if the seacock should fail or if the entire thru-hull fitting should snap or break off, the tapered dowel can be quickly hammered through the hole in the hull to stop the leak. Sets of these tapered dowels in various sizes are available at better marine supply stores, and they are well worth the time and trouble it takes to install them. The second item to check in the raw water cooling system is the sea strainer. This is usually a heavy gauge plastic cylinder with brass end fittings. It acts as a strainer to filter out debris from the sea water before it is pumped through the engine. Shine a light on the side of the "glass" cylinder to see if the strainer inside is clean. If it looks clogged up, close the seacock to prevent the sea water from flowing into the boat and then open the top of the sea strainer by loosening the two wing nuts at the top of the brass cap. Remove the strainer by pulling it straight up by the small handle inside and clean the strainer with water. Clean out the inside of the cylinder, replace the strainer, tighten the cap with the wing nuts and be sure to open the seacock to complete the job. It is not uncommon for a typical engine room to have four or more thru-hull fittings, seacocks, and sea strainers: one for each engine, one for the generator, and one for the air conditioning raw water pump. They should all be checked in the same fashion as described here. Additionally, there will be many other seacocks in the engine room and throughout the boat for raw water intakes and waste discharges of various kinds. As stated before it is essential to not only know where they are but to check them regularly.

The final step in checking the raw water intake systems is to check all hoses and hose clamps for tightness, leaks, wear and cracks. All hoses connected to thru-hull fittings below the water line are required by code to have double (2) hose clamps at the thru-hull fitting. Check to make sure all of yours do, and add the second clamp wherever necessary.

CHECKING THE FUEL SYSTEM:

The next item to check is your fuel lines, and their related connections. For the most part this is a visual check from the lines running from the fuel tanks to the engines through the fuel filters. The first part is a rubber hose, often red in color, that connects to the fuel filter, which is usually located on the lower left front end of a typical gasoline engine. On gasoline engines without extra water separator filters like Raycor or Dahl, which are mounted separately from the engine, check the connecting nut, which is usually brass, looking for the moisture of leaking or weeping fuel. Check the connection on the filter itself, trace the fuel line from the filter to the carburetor, and check the connecting nut at the carburetor. Sometimes it is easier to feel for the moisture with your hand in spaces where getting a good all around view is difficult.

Finally, many newer gasoline engines have a yellowish green clear plastic overflow hose running from the fuel pump to the carburetor. Check this line, if applicable, to see that it is empty and clean. This is a safety device that kicks in if the diaphragm on the fuel pump ruptures. It sends the fuel up to the carburetor preventing it from spilling into the bilge; and, as stated above, it should be empty under normal conditions.

Checking the fuel lines on a diesel engine is pretty much the same, except that you are more likely to find an extra water separator filter, like a Raycor or Dahl, mounted separately from the engine. These filters have a clear plastic bowl at the bottom, where a flashlight can be used to see if the bowl is clean.

If it is dirty, open the large thumbscrew at the top of the filter cylinder and remove the cap. The dirty fuel can be drained into a spare container by loosening the drain plug at the base of the bowl. The filter can be removed, inspected and replaced with a new one, if necessary, through the top of the now open and dry cylinder. Close the drain plug after replacing the filter and re-fill the entire cylinder up to the top with clean diesel fuel. This is an important step because it prevents the fuel system from becoming

"air-bound." It is essential not to attempt to clean these filters unless you have a few gallons of clean diesel in a separate jerry can so that you can re-fill the filter cylinders.

To complete the job, tighten the cap by the thumbscrew, and be sure to properly dispose of the dirty fuel and filter ashore. The final step in checking the fuel system on a typical twin engine configuration that includes a generator is to check the fuel transfer manifold. If you have already traced and checked the fuel lines and connections coming out of the tanks looking for leaks, you will have discovered this manifold. As the name implies it transfers fuel from the various tanks on the boat to the various engines needing fuel, and on diesel engines, it returns the unused fuel back to the tank. The manifold, which consists of a series of small seacock type levers, allows you to run all the engines off of one particular tank-(say the forward tank), and then switch to another tank as the first one gets low. This is very useful in trimming larger vessels which are often carrying several tons of fuel in their tanks (the weight of 1 gallon of fuel is approximately 7 pounds, and larger yachts often carry several thousands of gallons of fuel). Care must be taken with diesel engines to make sure the returning unused fuel goes back to a tank that has sufficient capacity to hold the extra fuel so that the tank will not be overfilled to the point of rupturing. The simplest practice is to be sure the fuel is returned through the manifold to the tank from which it came. In more elaborate fuel transfer procedures for vessel trimming purposes, it is essential to check and monitor at timely intervals the levers on the fuel transfer manifold to be certain the fuel is flowing from the desired tank to the desired engines, and most importantly, that it is flowing back to the desired tank(s) in such a fashion as to prevent the aforementioned overflowing and rupturing.

TUNE IN NEXT MONTH FOR THE EXCITING CONCLUSION:

This concludes Part I of our discussion of the Quick Check List for Inboard Engines. Next month I will conclude by discussing the checking of stuffing boxes, steering systems and generators, as well as various miscellaneous items like belts, batteries, pumps, trim tabs, etc.

I would again like to express my appreciation. to the fine folks at Charles Point Marine in Peekskill, Mike and Ginny DiForio, for allowing me to use their outstanding new 24 ft. Formula 242SS Sun Sport, and their luxurious 36 ft. Formula Performance Cruiser for photographs.

Also, I would again like to thank their ace mechanic, Bobby Tencza, for providing his very valuable technical expertise.

*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 know 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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