

Featured Article – January 2004

Sanitation Systems

Nothing gives boat owners more grief than the boat's sanitation system. Many boat owners first become aware of the need to take care of the heads when THE SMELL greets them. We'll look at what causes the smell and ways to prevent or escape from unwanted odors.

Biological products decaying in an enclosed space cause the smell. Heat can cook the biological products, causing an unmistakable aroma. Smells are worse in the summer heat or if a design consideration places a heat producing source (like a refrigerator or air conditioner) near the holding tank. The best way to not have THE SMELL is to not have decaying biological products in the boat (owners are excepted). Unfortunately, there are all kinds of biological products in a boat that are unrelated to the heads. So, one of the first tasks is to trace the source of the odor from the bilge. Here are some examples. Shower sump pumps that don't empty completely or empty into the bilge are a common source of odors. Raw water leaking into the boat from stuffing boxes or simply standing in the bilge is a potential source of smells. Leaking oil is a biological product that can decay in storage, as can diesel fuel. Air conditioning ductwork also can trap molds and other biological materials that cause odors. If you have ever had a mouse die in a wall at your house, you know that it doesn't take a large amount of biological product to produce an overpowering aroma.

You can minimize these smells by keeping the bilge clean and putting some bilge cleaner in the naturally occurring water that accumulates in the bilge. I also put some deodorant down the shower drains to keep the sumps smelling better. I also clean the sump boxes about twice a year when I replace the failed automatic sump pump switches. Please send any suggestions on cleaning the air conditioning ducts.

What do you do if the smell is coming from the heads. The three usual suspects are the holding tank, the heads themselves, and the hoses.

Earlier I said that the best way not to have odors was to not store biological material. Lectra/san and Purasan treatment systems chemically treat sewage and discharge salt water into the environment. Lectra/san and Purasan do not actually store the waste material, but treat it as received. This is the best system to avoid smells as long as you do not boat in a No-Discharge Area. I tried to find where these areas are, but was unsuccessful. I contacted the US EPA with a request for clarification and have not received a response in two weeks. It appears that much of New England, New York City area, and New Jersey are No Discharge Areas or are proposed to become such areas. There was talk of completely banning Lectra/San type toilets, which led to a steep decline in popularity. There is a new type of Lectra/san toilet that will treat holding tank waste (rather than per flush waste as it does now). It is just becoming available and we'll have more about that in coming months.

If you use a holding tank, you must treat the holding tank contents. You can treat the holding tank with deodorants or with enzymatic cleaners. I strongly recommend that you use enzymatic cleaners because they actually treat the waste material, rather than simply masking the odor. However, if you use an enzymatic cleaner, you must also be very careful about what goes into the holding tank, specifically the bowl cleaner. If you use chlorine containing cleaners with certain enzymes, you will kill the enzymes and render them useless. I use the Raritan set of products, CP for Cleans Potties and KO (Kills Odors). Raritan products do not contain known carcinogens in their treatment products. Holding tanks are not storage tanks. They should be emptied when you return or at the end of the weekend. Waiting until the tanks are nearly full to pump out is false economy. Holding tanks rarely need to be replaced.

We are aware of a couple of design issues that can add heat to the holding tank and increase the odor production. One is reported by Mel Soule. His refrigerator compressor heats up the holding tank. He fixed this by installing a computer cooling fan next to the refrigerator, resulting in a decrease in the smell. Another design issue is where an air conditioning unit heats up a holding tank in the aft cabin. How

romantic. Placing some insulating material between the air conditioning unit and the holding tank takes care of this issue.

Now for the heads. Raw water heads smell more than fresh water heads. Raw water has more biological products in it (we hope) than fresh water. Smells can come from the raw water intake – the hoses and/or strainer. You can convert a raw water intake head into a fresh water intake by adding a switch, a solenoid, and a couple of “T’s”. This should reduce the odors caused by raw water. The components in the head can wear and not form a good seal causing some odors. For example, the head output pump that removes the waste can be worn and form an incomplete seal or fail to remove all the waste material. Usually, the macerator can be rebuilt by using a kit. It is not the easiest repair I’ve ever done, but it can be done. Seals and seats also wear and dry out and must be replaced. Most heads have a small amount of water in the bowl to act as a seal against odors. Again, if this is raw water, it can quickly become stinky. If your bowl doesn’t retain a bit of water, you may need to replace a seal, valve, or fitting. If the head makes a lot of noise when operated, it may be time to replace some of the discharge or water intake parts.

Putting foreign material into the heads can also jam up the toilet and hoses, preventing removal of waste material. We have pretty strict rules about not putting anything that hasn’t been eaten into the heads. We’ve still had to remove stuff. Feminine hygiene products are especially troublesome, but paper towels also create real problems. I know from experience.

Then we have the hoses. Sanitation hoses, that is, the ones that carry waste material away from the bowl are lined with a material that minimizes the smell. This lining eventually wears away, resulting in something called permeation of the hose. There is a simple test for hose permeation. Take a white, damp rag and rub the hose. If the rag discolors (becomes brown), the hose must be replaced. Putting certain chemicals through the sanitation hose can destroy the barrier lining. These are chemicals that we commonly use at home. Any product that contains chlorine or alcohol will destroy the lining. Chlorine and alcohol are frequently in home toilet bowl cleaners. Again, we recommend a Raritan product, CP (Cleans Potties) to reduce the risk of damaging the barrier lining. Using an alcohol based antifreeze during winterization can also destroy the lining. When the barrier lining is gone, it’s time to replace the sanitation hose.

Rube Goldberg must have designed the sanitation hose layout for boat’s sanitation systems. First, if you are replacing any hose associated with the sanitation system, **DO NOT CUT UP THE HOSE**. The best way to replace a hose is to fasten the new hose to the old hose and pull the new hose through the bulkheads and crawl spaces by pulling on the old hose. One might think that the hoses would run straight through a bulkhead or stringer, but they frequently do not. The best method for this is to disconnect the hose at the **HIGHEST POINT**; insert a hose barb in the old hose, then into the new hose; grind or cut away the barb’s lip (this makes sliding the hoses through the bulkheads and stringers easier); wrap the joint with duct tape; and gently pull through to the **LOWEST POINT**. It’s best to have someone feeding the hose from the top. Heating the hose helps, too, as it makes it more pliable. After you have run the new hose (allow a little extra hose for connections and mistakes), begin to cut up the old hose into short, manageable lengths directly into heavy weight, plastic garbage bags. This is a key point. Use hose cutters that are something like big scissors. This is worth the extra cost. Trying to remove sanitation hose that leaks waste all over the bilge or flips material all over the bilge while trying to cut with a razor blade can be challenging to say the least. This is a dirty and difficult job. You may encounter an anti-siphon valve that can become stuck. You can replace the anti-siphon valve or you can test it by trying to blow into the valve. There isn’t enough money in the world to have me test an anti-siphon valve.

While you are replacing the sanitation hoses, you may also want to consider removing some of the “traps” that can add to the smell. Many boats have two holding tanks. These tanks are connected to each other by a “Y” so the waste material can be moved from one holding tank to another. The Y frequently traps waste material that cannot be easily removed. The reason the holding tanks are connected is so the waste material can be pumped overboard. You can remove the Y and the associated hoses in most cases. In at least two cases that I know about, this fixed the smell problem. There is an overboard pump, seacock, and associated hoses that, for most boats, can be removed. In the newer boats, it has been removed and is only available as an option. The overboard discharge mechanism frequently clogs with

waste material, whether or not you have ever pumped waste overboard. I have cleaned this mechanism out (not a pleasant task) for a couple of years in a row. It still plugs up. I don't know the physics of how that works, it just does.

All holding tanks are vented, that is, they allow air to enter and escape. When the vents become clogged, the holding tank pressurizes and can cause what was described by one witness as a "poop volcano" while attempting a pump out. Vents become clogged when the holding tank overfills and waste material keeps air from moving in and out. This is serious, because the vent hoses don't have the enzymes in them to dissolve the waste material. In other words, it may be time to replace the vent hoses after they become clogged. Some vent hoses also have a charcoal filter to remove the smell discharged to the outside. Most manufacturers recommend annual replacement of the charcoal filter.

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