Got Water? TROUBLESHOOTING AND PREVENTION FOR HOUSE WATER SYSTEMS

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"The tanks are a little rusty," was the tender skipper's response to my request for fresh water to top up my tanks. "That's OK, I've got a filter," was my reply. We filled the tanks, went on about our business, and within hours our house water system stopped working. The faucets just dribbled, and then quit altogether. No coffee water, no cooking, no washing, not even a hot shower. Nothing, until I pulled apart the filter casing and removed the element, which was totally plugged with rust scale.

The house water system rarely gets much attention unless it quits working. We're so used to turning the tap and getting pressurized, sanitized water on demand at home that it's easy to forget that the water system on the boat is somewhat more complicated and vulnerable.

At its very simplest, a house water system consists of a filler, a tank, feed lines, a pump and an outlet, the latter two of which may be combined in the case of a manual pump. Not too much problem, as long as you don't get stuff growing in the tank and you don't let the lines freeze; but the system gets complicated when you have multiple tanks and feed lines, selector valves, in-line filters, power pump with pressure switch, accumulator tank, water heater, and multiple valves, faucets and shower heads. Add a municipal water inlet and maybe a watermaker, and the complexity increases even more.

Despite this complexity, water systems are pretty reliable provided that they are installed correctly and that minimal inspection and maintenance is done. Following are a few tips.

Tanks should be made of steel, stainless, plastic, rubber, or other materials, although almost all of them impart some odor or flavor into the water. Thick-walled polyethylene is probably best for strength and durability. Steel tanks will rust, as noted above. Flexible tanks are suitable for installation in awkward locations. Theoretically flexible tanks need not be vented, although they usually work better if they are. Other tanks need vents, which should be big enough to allow air to escape at the same rate that pressurized water is injected through the filler; otherwise internal pressure during rapid filling may damage fittings or hoses. Vents can terminate inside the vessel, and this prohibits contamination of drinking water from dirt or seawater.

Peculiar flavor imparted to the water from the tank can be minimized or eliminated with any of several commercially available drinking water "sweetener" treatments, or by flushing the tanks with a weak solution of baking soda. Inline filters also are supposed to remove undesirable tastes from the water.

Where feasible, locate filler caps above deck level so that water isn't contaminated by substances on the deck during filling, or if the deck cap should leak. Normally, however, fillers are flush with the deck. In that case, it is imperative that the filler caps are appropriately marked to distinguish fres h water from fuel fillers and holding tank pump-outs. You can buy bronze deck fitting caps engraved with the correct labels.

Feeders can be hose, copper pipe, or plastic pipe. All three are suitable, with plastic pipe essentially maintenance-free. PVC is used with cold water and CPVC with hot water. Copper is maintenance-free too, although over the years and with engine vibration it can eventually become fatigued and crack. The copper pipe in my boat is nearly 30 years old and shows no sign of cracking so far. Hose is more susceptible to chafing where it passes through bulkheads or over rough edges, and it doesn't look as neat, but it has the advantage of being a little more resistant to damage from freezing. Copper and plastic pipe will split. If you opt for hose, avoid clear hose which lets light in, since that can allow algae to grow inside the system. Use pipe tape or sealant, as appropriate, on each joint to prevent leakage.

You're sure to want a filter in the system. Most are installed between the tanks and the pump, to protect the pump from contamination, but you can put a filter after the pump, because the pressure provided by the pump and collector tank make it easy to check the filter seal for leaks and prime the filter container after changing the element. In either case, this is one of those rare, happy situations where you can use a common household device on a boat. Your hardware-store-variety home in-line water filter is entirely adequate for marine application as a sediment and taste filter. The typical one has a two-piece plastic case which contains a hollow cylindrical filter element about six inches long. Carry a few spares and you should have no problems. Be aware, however, that these taste filters do not remove bacteria, viruses or cysts of certain parasites, such as those which cause giardia, the condition commonly known as ("beaver fever").

If you fill your tanks from a treated municipal water system, one of these household "sediment and taste" filters is all you need, but many tenders and remote fish processors in Alaska draw their water from streams and ponds that may be contaminated by any of various biological agents, or even from industrial or non-organic pollutants. Several firms make more sophisticated filters or treatment systems which combine filtration with ultraviolet light sterilization. Some are integral with the faucet, others are under-the-sink installations. They're pretty pricey, but you have to balance the cost with the loss which would result if your crew took sick with a serious gastrointestinal ailment like giardiasis. Filters are available through marine supply outlets and are advertised in magazines catering to voyaging sailors.

Most commercial vessels and power yachts use electric demand pumps to pressurize their water systems. They are activated by a pressure switch which switches on the pump when the pressure in the line at the outlet end drops to a certain point. Although the pump can be plumbed directly to the line, most setups use an *accumulator tank* to hold pressure in the line. This saves wear on pumps and switches and quiets the system by allowing small withdrawals of water (enough to wash your hands) from the system without triggering the pump. An accumulator tank can also eliminate *hammering*—the sound which occurs, especially in metal plumbing, when pressure is abruptly applied to the system or cut off. Some pressure pumps are impeller type, although the electric diaphragm pump is considered quieter and more reliable.

A water heater makes life on board somewhat more pleasant, and various models of marine units are available in sizes ranging from six to 20 gallons or more. Don't try to substitute a home unit—it's not stainless and won't stand up to the marine environment, and could be dangerous if it came apart and shorted out an AC electrical system. Most water heaters require 120V AC power to operate electrically, but also have the engine cooling system option. Since your diesel runs at an internal temperature of around 180° F, it is an excellent source of heat and, unless you sit for long stretches of time without running the engine, you probably won't even need to use the electric heating unit. Keep in mind that the electric unit will destroy itself in minutes if it is ever run without water in the tank, so carefully label the switch or, better yet, don't even connect it to the electrical power source. Some diesel ranges and bulkhead heaters, such as the popular Dikinson models, have a water heater coil option, although they are not considered to be as effective at heating water as a dedicated heater.

A shower is also a great luxury, and not hard to include if you have adequate space, a pressure pump, and a water heater. If the floor of the stall is above the waterline, it can drain directly overboard, but most units are situated lower than that. If yours is, try to avoid the temptation to drain it into the bilge, where it would add hair, skin cells, soap and scum to whatever else is already down there. A dedicated shower sump with a float switch will prevent these problems at modest cost. Be sure to put a simple, easy to clean in-line filter in the shower drain so that you can periodically clear the hair and other debris before it jams the float switch or pump.

Winterizing a water system is pretty straightforward. Siphon all the water out of the tank(s) and run the taps until the lines are empty. A simple by-pass pipe can be made for the water heater so that it can be emptied while at the same time the pump can force essentially all the water out of the lines. Fill the lines with RV antifreeze by disconnecting the feed lines from the tanks, and put them directly into the antifreeze jugs so that the fluid is drawn directly into the lines without filling the entire bottoms of the tanks. This saves money and eliminates the need to flush gallons of diluted antifreeze from the tanks. Open the taps and run the pump until the pink fluid burbles out of all outlets.

Be sure to use only proplyene glycol antifreeze, which is made for water systems and is non-toxic, although it's not good to drink and should be thoroughly flushed from the system before going back into service. The safe stuff is usually pink, as opposed to the yellow or green of engine antifreeze. Flushes should continue until the pink color disappears to rid the system of the unpleasant taste.

Remember, if you drain your water heater in the fall, be sure to remove the bypass pipe and refill the heater tank before testing the power switch to the main element.

Troubleshooting mostly consists of figuring out why the pump doesn't work at all, runs but doesn't move water, or runs when it shouldn't. Many problems can be traced to faulty pressure switches, which may be integral to the pump. A faulty switch or faulty connectors and wiring leading to and from it, can cause the pump to fail to run, and a quick check with a volt-ohm meter should tell you whether your switch is getting power or is faulty.

A pump which runs but doesn't move water could be clogged by debris, could have damaged diaphragm or impeller, or could have a vapor lock or air bubble in the line. If it is an electric diaphragm type, first check the drive belt to insure that the motor is actually running the pump. Be sure there is adequate water in the tank and shutoff or Y-valves are in the correct positions, and check the suction side strainer if it has one. Experiment with running, starting and stopping the pump with combinations of faucets open and closed to try to back water up to the pump and create enough pressure to move the bubble. If necessary, disconnect the line just upstream of the pump and put it into a jug of clean water to prime the pump. If these maneuvers are unsuccessful, it may be time to disassemble the pump to see if the problem is inside.

Repeated cycling on and off when the taps remain closed is the result of a pressure leak in the system, or a defective valve inside the diaphragm pump. To test for a pressure leak, close the taps and let the pump run until it stops, then cut the power to the pump. After a few hours reconnect the power; if the pump comes on and runs for more than a second or so you have a leak in the system. The culprit is usually a loose hose clamp, but it could also be a bad seal on the filter, a defective bladder in the accumulator tank, an improperly tightened flare fitting connecting copper pipe, or even a small crack in a pipe due to vibration. It is worth checking this out, since it could be dribbling water into the interior of your boat, possibly in some inaccessible location where it could be doing serious damage to woodwork.

One more thing: if your boat tends to heel or list to one side, such as while pulling gear or when beached, be sure to put check valves in the sink drains, or use gate valves to close off the drains altogether when in a condition where the list may occur. A sharp list may put the sink below the waterline and set up a siphon effect when the water gets above the drain outlet, causing the boat to fill with water. ✦