Bilge Pump Installation and Maintenance Tips

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The low-capacity bilge pumps we tested included 10 models from Shurflo, Johnson Pumps, Rule/ITT, and Attwood.

The best bilge pump in the world won't keep your boat dry if it's not properly installed and maintained. While bilge pump installations are fairly straightforward—and definitely within the scope of DIY projects—there are several factors to consider (capacity, wire size, hose diameter, fuse size) before you begin, and there are some good rules of thumb to follow.

CHOOSING AN ELECTRIC PUMP

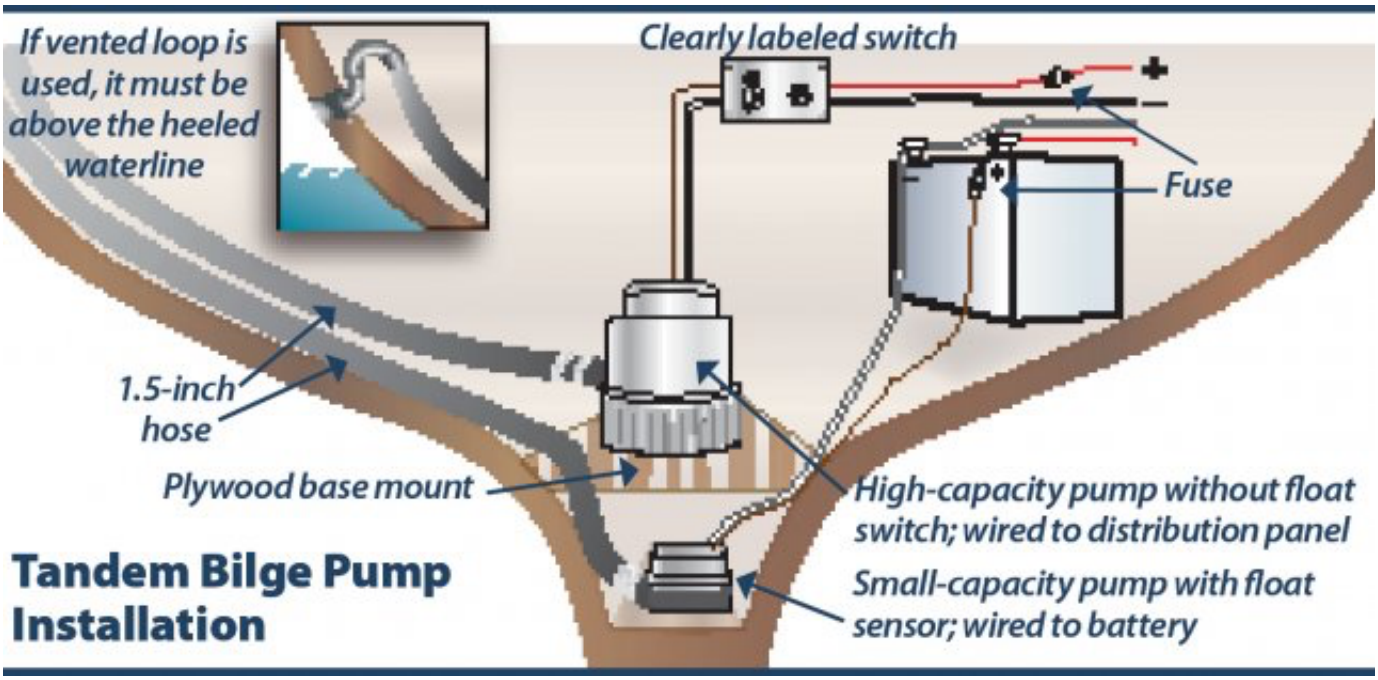
The first step is selecting the right bilge pump(s) for the job. We recommend installing two electric centrifugal pumps (preferably one with automatic water level sensor): a smaller pump mounted at the belly of the bilge to handle the incidental bilge water (rain, stuffing box drips, etc.) using minimum power and another pump mounted a few inches higher to handle bigger jobs. There are several reasons for this; the main one being that a back-up is always installed should one pump fail.

• Capacity: For most mid-sized boats (30-35 feet in length), we'd recommend a 1,000-1,500 gallon-per-hour (GPH) pump for the primary and one with a capacity of about 2,000 GPH for the backup. The American Bureau of Shipping recommends one 24-gallon-per-minute pump (roughly 1,440 GPH) plus one 12-GPM (720 GPH) pump for boats shorter than 65 feet.

When comparing output specs on multiple pumps, be sure the rating criteria are the same. New standards set by the American Boat and Yacht Council (ABYC) require that compliant makers rate pump capacities so that they reflect real-world usage. The ABYC stipulates that pumps be rated with a head height (also called vertical lift) of 1 meter and a hose length of 3 meters, and with a head height of 2 meters and hose length of 6 meters. Head height is the vertical height of the hose outlet above the pump outlet. Head pressure (also referred to as static head) is the resistance that a pump has to overcome when pumping water up and out of the boat. It includes the resistance generated by the vertical distance the pump has to move the water up (vertical lift) and any resistance generated by the discharge plumbing (hose kinks, ribbed hose, fittings, and bends). Some ratings also will be given at 13.6 volts, rather than the more realistic 12.2 volts (for a 12-volt system). The latter will more accurately reflect capacity in real-world conditions.

• Key features: An automatic pump will rely on a water-level sensor such as a float switch to activate the pump. This can be a separate unit or one that is integral to the pump. This sensor should resist fouling and be easy to test for

proper operation. Common float switches should be in a housing, otherwise they are more prone to fouling by debris in the bilge. An easy-to-access strainer (or strum box) is also important, as are long wire leads, which help keep connections out of the wet bilge area.



Regina Gallant

When installing two electric pumps, the lower-capacity pump should have a built-in float switch, be mounted at the lowest point of the bilge, and be wired straight to the battery through a fuse. The higher-capacity pump is installed a few inches higher, but not directly above the smaller pump.

INSTALLATION

The illustration above shows one recommended setup for automatic bilge pump installation.

• Location: According to the ABYC, the pump inlet must be positioned so that bilge water can be removed when the boat is in a static position and when it is at maximum heel (ABYC H-22). The mounting location also should make it easy to service the pumps and to clean them, particularly their strainers.

The discharge outlet (thru-hull) must be above the maximum angle of heel so that water outside the boat is not siphoned inside the boat. According to

ABYC H22, if you can't position the discharge this way, a vented loop (installed above the heeled waterline) and a properly installed seacock must be included in the setup. (Check valves should not be used in this scenario.)

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• Plumbing: When plumbing an electric bilge pump, be sure the setup is designed to reduce head pressure as much as possible to maximize discharge capacity: use smooth hose sized to meet maker recommendations; keep hose runs as short as possible; and try to avoid bends, turns, and elbow fittings in the run. In terms of adding resistance, using a 90-degree bend in a 1-inch-diameter discharge hose is the equivalent of adding 3 feet of hose to the line, which is like a 3,000 GPH pump being reduced to a 2,000 GPH pump, if the battery is fully charged. According to pump maker ITT/Rule, small electric submersible pumps are rarely useful with more than 4 feet of vertical discharge head and medium/large submersibles are similarly ineffective with more than 7 feet of head.

The discharge line should rise steadily to the through-hull or loop. If there are any low spots in the run, water will pool there once the pump cycles off. This can create an airlock when the pump is activated again, and the pump likely will stall. Hose connections, as recommended by the ABYC, should be made with non-corrosive clamps and should be airtight.

• Wiring: Use correct size wire and fuses: The proper wire size reduces voltage drop and properly fused wiring reduces risk of a locked rotor (a motor that's trying to turn, but can't) causing an overcurrent situation and potential fire

hazard.

Consult the American Wire Gauge 3% voltage drop table (www.marinco.com/page/three-percent-voltage) to be sure you're using large enough wire. Remember that the run length given in wire-gauge tables is the sum of the positive and negative legs of the circuit; a pump 10 feet from the battery will be referenced as having a 20-foot wire run.

For the fuse size, simply go by the pump maker's recommendation, and you should be set. The fuse, per ABYC standards, should be installed within 7 inches of the power source.

If the pump's leads are too short, extend them carefully. Use oversized tinned marine wire and adhesive heat-shrink connections. ABYC standards recommend using a length of water-resistant electrical cable, sealed at the pump connection, so all electrical connections can be made above the max bilge water level.

• Accessories: A few accessories to consider adding to the bilge pump system include a visual/audible bilge alarm, bilge switch, and a cycle counter. ABYC standards require an alarm on boats with enclosed berths. Be sure that the alarm is loud enough to be heard over engine noise while underway and ideally by passersby or marina personnel when docked.

Automatic pumps should always be fitted with a readily accessible and clearly marked manual switch so that even if the owner isn't around, anyone (crew, marina neighbors, or passersby) can locate and activate the switch when the need arises. Switches also should offer visual indication that the pump has power supplied to it. Our top pick for mercury-free bilge switches, reviewed in the January 2006 issue, is the electronic Water Witch 230.

If the larger-capacity pump has a float switch, we highly recommend connecting it to a bilge alarm (and alarm cut-off switch). That way, hopefully, the horn will get someone's attention before the constant cycling of the pump

drains your batteries. We reviewed the Aqua Vigil Alarm in the May 15, 2001 issue, and deemed it “simple but quirky.” We plan to revisit bilge alarms and cycle counters, including combo units like the Aqua Alarm pump monitor, alarm, and counter.

Two good references on bilge pumps and installing them are “This Old Boat” by Don Casey and Nigel Calder’s “Boatowner’s Mechanical and Electrical Manual.”

MAINTENANCE

Regular and frequent inspections of your bilge pumps are a must and should be included in the vessel’s overall preventative maintenance program. This helps you know when to replace worn or damaged components (bad float switches, deteriorated hoses) before they fail. Before you set sail, it’s always a good idea to make sure the pump has power and is working properly, keeping in mind that testing should verify the actual pumping of water overboard, rather than (in the case of electric pumps) simply switching the pump on and listening for motor operation.

Keeping your bilge clean can be a hassle, but it doesn’t compare to the headache of a locked rotor or an impotent bilge pump in an emergency.

For more details on specific pumps, check out our most recent tests of high capacity bilge pumps of greater than 1,500 GPH, and and smaller pumps rated at 1,500 GPH.

For more comprehensive guidance in carrying out an upgrade of your boat’s essential systems, check out our 5-volume ebook series on Marine Electrical Systems at http://www.practical-sailor.com/books.

Capt. Frank Lanier is a long time PS contributor and an accredited marine surveyor with over 30 years of experience in the marine industry. His website is www.captfklanier.com.