

Bilge Pumps – Your Friend in Dark Places

As with batteries discussed last month, bilge pumps spend their lives hidden from view, yet they perform a critical function for safe boat operation. A non-functioning or incorrectly installed bilge pump can fail causing flooding of non-waterproof components installed above normal bilge water level, result in a fire hazard, or even cause flooding of the boat and sinking. The latter was driven home by a sinking of a boat in our marina last summer.

First things first. A bilge pump system is intended for control of spray, rainwater and normal accumulation of water due to seepage and spillage. A bilge pump is NOT intended for damage control, and is far undersized for damage control purposes. A one-inch hole in the hull one foot below the waterline will cause flooding that will significantly overwhelm all but the very largest bilge pumps systems. This includes manual bilge pumps. A damage control pumping system is a different beast and is beyond the scope of this article; few pleasure craft are fitted with such systems.

Bilge pumps should be fitted in the low point of each separate compartment of the bilge. They may be of the submersible type, or of the non-submersible type. The latter obviously must be installed above bilge water level, with the inlet hose sitting in the bilge area. The rated capacity must be adapted for the size of the compartment and the degree of spray, rainwater or seepage/spillage likely for the vessel in question. Sizing must also be adapted for the losses inherent in the installed system. The rated output of the pump will be associated with the installed conditions specified in the owner's manual for the pump. Output will be reduced by increased head (height to which the water must be pumped), increased hose length, increased hose roughness, increased number of bends in the hose and decreased hose diameter. This reduction may be substantial, and is frequently more than 50% of the base output of the pump itself.

The inlet hose for the pump must be fitted with a screen to prevent ingress of objects that could block or cause damage to the pump. Obviously frequent cleaning of the screen is required, as is maintaining a clean bilge. Note too that pumping overboard of oil or fuel is unlawful and subject to substantial fines. Correction of any situation that is causing oil and fuel accumulation is to be considered an urgent matter. For normal oil leakage, the use of a drip pan under the engine and absorbent bilge devices are recommended. The use of pump switches dependent on the conductivity of the bilge water (e.g. Water Witch switches) can provide further protection against pumping of oil/fuel as the relatively non-conductive nature of these fluids means that their presence alone will not activate the pump.

On failure, bilge pumps can create a siphon condition. For this reason, and to prevent back-flooding, the output hose from the bilge pump should be created above the heeled waterline of the vessel (7 degrees for powerboats, the mid-ships sheer line for sailboats). If the output is located below this heeled waterline, the through-hull must be fitted with a sea-cock, AND a siphon-break or other device to prevent back-flow must be installed in the discharge line. Note that check valves are NOT permitted for this purpose. Where multiple pump outputs are fed to a single manifold, the manifold must be designed such that the output of one pump cannot back feed the other discharge lines. The use of a sea chest is a practical means of achieving this. Again though, check valves are not allowed for this purpose. Check valves may only be used to prevent cycling of the pump due to back-flow at pump shut-down.

Both manual and automatic switches should be installed. The automatic switch may be integral to the unit, or installed as a separate switch, most frequently a float switch. The switch should be cleaned and

tested regularly. The installation of a second pump and discharge, with its switch located somewhat higher than the main pump, is a great way of ensuring that the primary pump failure will not result in flooding of the bilge. Finally, the bilge pump should be installed in a location that is readily accessible so that cleaning, testing and inspection may be routinely carried out! I see many boats where the pumps are very difficult to access, or where access requires removal of other installed components. It is fair to assume that these pumps don't see much cleaning or service! For vessels with accommodations, the installation of a high water alarm is highly recommended, advising the operator and occupants that the bilge water is exceeding normal levels, and clearly audible at the operator location.

Finally, electrical connections of bilge pumps are perhaps the most overlooked element that I see in my inspections, yet are relatively simple to ensure correct. Pump manufacturers are required to provide clear instructions on installation, so start by reading the manual and following the instructions to the letter. At a minimum, the following should be ensured:

1. 1) Electrical connections should be made above the normal level of bilge water. Where this is not possible, connections must be water-tight. The use of heat shrink connectors is an effective means of achieving this.
2. 2) In addition to the fuse/breaker at the ships panel, intended to provide protection to the conductor feeding the pump, an in-line fuse should be installed at the pump itself in accordance with the fuse size recommended by the manufacturer. This fuse protects the pump in the event of a locked-rotor condition. It was the lack of such a fuse, combined with an underwater discharge without a siphon break that cause the sinking of the boat in our marina.
3. 3) Any external metal components on the pump must be fitted with a ground wire of adequate size. The owner's manual provided with the pump should identify such requirements.