A Bilge Pump in Your Kayak

by Kevin Dunsford

Why do you need a bilge pump?

A couple of years ago I was solo kayaking across a wide crossing, miles from any land and I played a "what if" game. What if the wind was screaming, the swell was increasing and I kept capsizing? What would I do? Capsizing is OK for a while if you can Eskimo roll or re-enter but after a while you run out of energy and the potential of hypothermia and drowning is a real possibility. A kayak filled with water is like a log. It has no stability. What can you do in this situation?

I decided I needed a pump. The selection was hand pump, foot pump or electric pump. A common hand pump was out because in the above scenario I needed both hands on the paddle for balance. After a bit of investigation I found the best foot pumps are only half as efficient as electric pumps so I set about investigating electric bilge pumps.

I approached a very experienced professional kayaker, Chris Gulley, who uses electric pumps and he recommended a removable unit rather than a fixed pump.

"You need to be able to recharge batteries and transfer the pump to another kayaks if the need arises." he said. He lent me one of his portable electric pumps to try and I have unashamedly pinched all his good ideas for this article. But – I wanted one bigger and better than his, so here it is.

About bilge pumps

The selection of a bilge pump is based on two main factors, pumping capacity and the power required to drive it. The pump needs to be able to operate while submerged in salt water and it must be able to run dry while pumping. Checking out the marine stores I found several brands of bilge pumps of varying prices, shapes and capacities, but all the sales people I spoke to recommend the well respected USA "Rule" brand because it can run dry without damaging the pump.

Bilge pumps come in all shapes, sizes and capacities.

Pump capacity

Rule pump capacity is measured in gallons per hour (gph) and rates from 360 gph to 8000 gph. This type of pump works like centrifuge, throwing water out to the side though an opening into a hose. Pump capacities are based on a zero length hoses but in a kayak the pump hose can be about 750 mm long, long enough for the pump in the bottom of the cockpit to expel water at the top end of the hose say 30 or 40 cm above the pump, out of the spray skirt. This markedly reduces the effective gph capacity.

Power required

Generally, the greater the capacity of the pump the greater the power required. Bilge pumps come in 24 volt or 12 volt models. If I was going to carry a lead battery

around, I wanted to be able to use it for other things as well so decided on a 12 volt requirement.

Power (watts) = Voltage (volts) times Current (amps).

With a 12 volt battery the power required by the pump is directly proportional to the current (amps). Battery weight and size is also proportional to the current it can deliver so a compromise must be achieved. Also when the pump is initially switched on the battery must be able to deliver enough current to start the pump; this is called the "initial current". Batteries have an initial current rating stamped on them. Many have an initial current rating less than their normal maximum operating current but some have no initial current restriction at all.

Checking the Rule range of bilge pumps from the Rule 360 gph to Rule 1100 gph, which I considered the largest pump bulk-wise that was acceptable, against the current requirements I found one pump, the Rule 1000 gph required only half the operational current of others around the same capacity i.e. only 2.9 amps. In addition it was the only square pump which I considered would be the easiest to mount.

Matching the battery to the pump

When choosing a battery three things must be considered: voltage (12 or 24 volts), maximum current (amps) that the battery may deliver, the battery capacity (in amp hours, Ah) and the initial current (amps) to start the pump.

I found the Global ES-2.9–12, a 12 volt battery, can deliver 2.9 amp hours with no initial current restriction. This battery would drive the Rule 1000 gph pump for a whole hour and enable it to pump up to 1000 gallons, i.e. 17 gallons a minute or 63 litres per minute (1 US gallon = 3.8 litres). If I have to pump longer than an hour I might as well throw in the towel.

Planning the location of the pump unit

Before constructing the pump unit is important to look inside the cockpit and decide where it will be positioned. It must be on the floor of the cockpit since that is the lowest water level. You may be out of an upside-down boat so you don't want the pump to drop out. The exit tube must be able to protrude out of your spay-skirt or hull while pumping. At first I thought it might be possible to have the tube exit through the deck but when I saw the 25+ mm diameter of the tube required I soon dropped the idea of a hole this large through my deck. In addition you may want to use the pump in another compartment or to pump out your mate's kayak so it may be best to be portable.

In my case the ideal position was on the floor of the cockpit in the space behind the moveable seat of my Albatross sea kayak. The unit would need to be positioned on either side of a 2 cm square aluminium rail going lengthwise through the cockpit on which my seat and pedals slid.

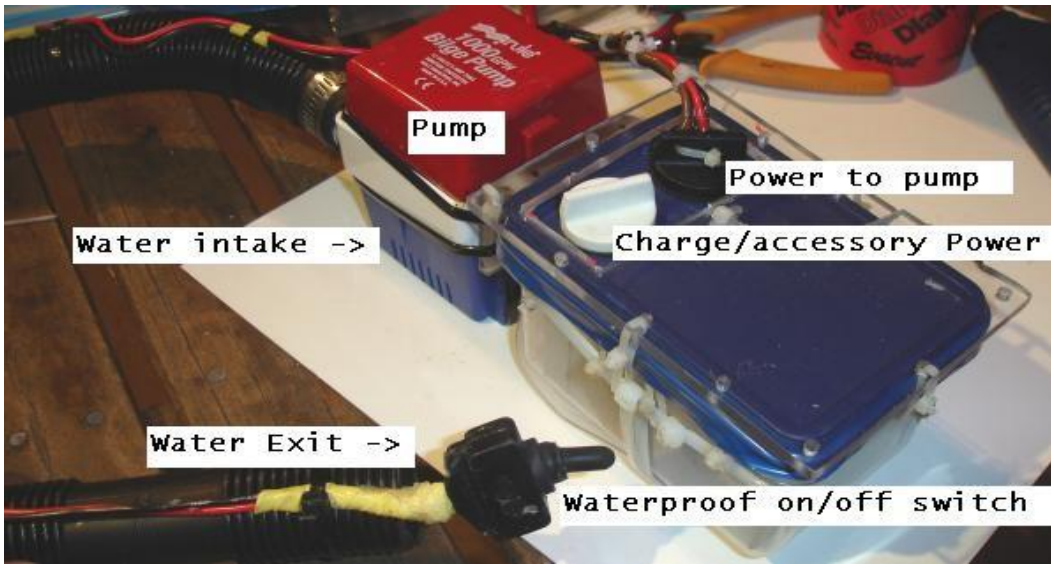
Also it should be noted that a bilge pump operates submersible so will not remove perhaps the last 25 mm of water which may have to be removed with a sponge.

Construction

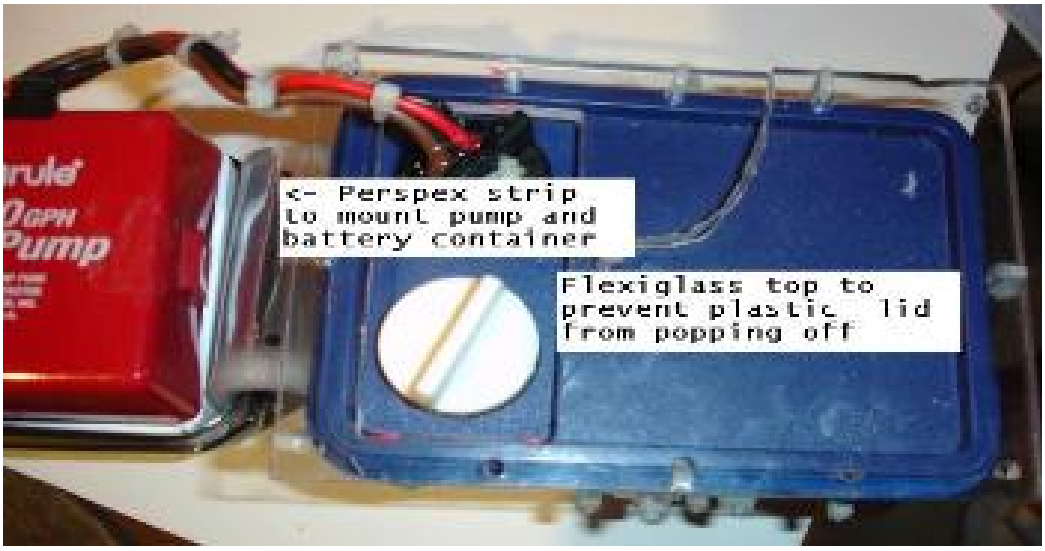
Components

1. Battery - Global ES-2.9–12, a 12 volt battery, can deliver 2.9 amp hours
2. Bilge pump - Rule 1000 gph requiring 2.9 amps

3. Switch to turn the pump on and off – Dick Smith toggle switch with waterproof cap
4. Wiring – tinned copper wire (to minimise corroding) and a 5 amp fast-blow fuse
5. Waterproof container for battery, wiring and fuse – plastic resealable food container from supermarket (see note later)
6. Mounting to hold it all together strip of Flexi glass or Plexiglas™ or Perspex™, bent to shape in a domestic oven at low temperature
7. Exit hose – 25 mm ribbed plastic flexible hose (keep it as short as possible)
8. Electrical contact from bilge pump wires through container to battery - boat screw-in bung and socket with wires sealed in screw-in bung with hotmelt plastic
9. Electrical contact to charge battery and use power from battery – boat screw-in bung to seal. Unscrewed from socket when charging or taking power for other sources to reveal 12 volt power-adaptor socket glued under bung-socket. Note: when the "sealed battery" is charged it will release a small amount of hydrogen so it must be allowed to release otherwise it may explode! This requires the battery compartment to be open while charging.
10. Plexiglas™ or Perspex™ plate covering push-on battery container plastic top with securing cables. This was found necessary since the plastic container top may pop off in extreme conditions such as a surf landing in spite of plastic electrical tape to seal the lid to the container. See diagram below.



Completed unit



Top view

Construction photos

Fig. 1 Top view

Fig. 2 Mounted in cockpit behind seat

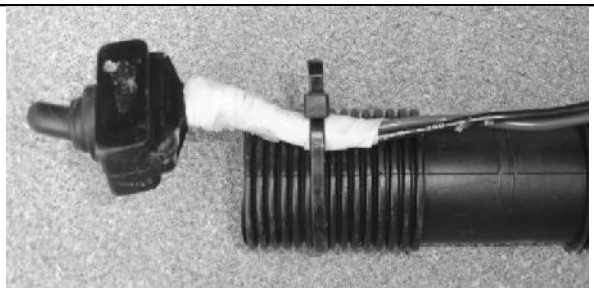


Fig. 3 Waterproof switch and exit hose

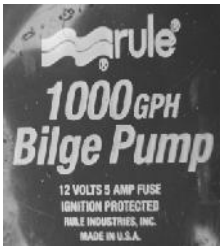


Fig. 4 Bilge pump

Fig. 5 Pump side on

Fig. 6 Underside showing flexi glass support

Links

- Independent evaluation of bilge some pumps:
  http://www.powerboat-reports.com/newspics/pdfs/13-6-VG.pdf
- Kiwi Association of Sea kayakers (KASK)
  http://www.kask.org.nz
- Author - Kevin Dunsford <kevin@kayaker.org.nz>

PS: I don't sell any of the above stuff. I kayak for pure pleasure and to experience one of the last freedoms left to ordinary folk on earth – to go almost anywhere on the sea without undue regulation or taxes. My motto is "use it – or loose it".