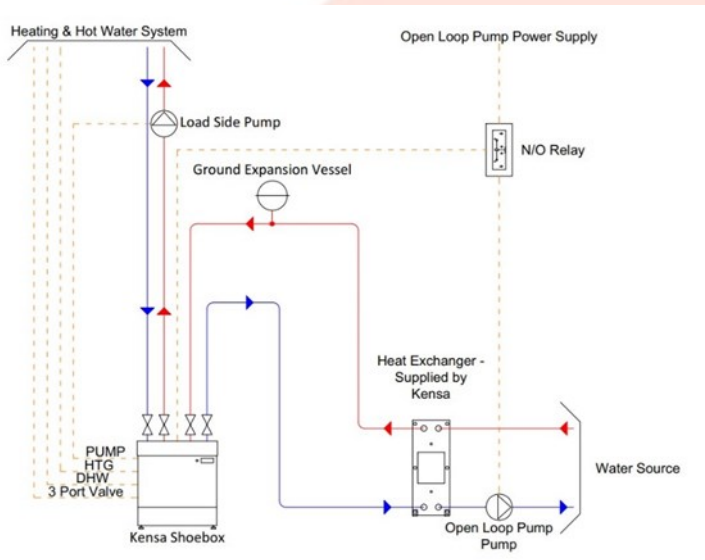
Introduction

While many house boats are seen as holiday accommodation more and more are becoming lived in as a full time home. In both cases boats are now seen as requiring heating both space and hot water. Traditionally this was done using the boats fuel, diesel, but more and more owners are now looking at renewable technologies such as heat pumps to provide this heating.

Large volumes of flowing water paired with a Kensa Heat Pump can take energy from a number of different incoming sources in order to provide heating and hot water. This application information focuses specifically on houseboats and understanding how we can utilise the large volume of water that surrounds the houseboat as the incoming energy source. This volume of flowing water is your renewable energy passing right by your door.

To avoid freezing, the water source will need to be at a temperature of a minimum of 6°C, supplementary heating my be necessary if the source temperature does fall below 6°c. as the outer source may freeze.

As with all projects we need to understand the peak heating and hot water load before sizing the correct heat pump and type of exchanger. Once we have an calculated load we then need to look and decide on the best method of energy extraction. Here are some of the best methods of extraction for house boat applications:



Schematic 1 – Open loop indicative layout

Open Loop

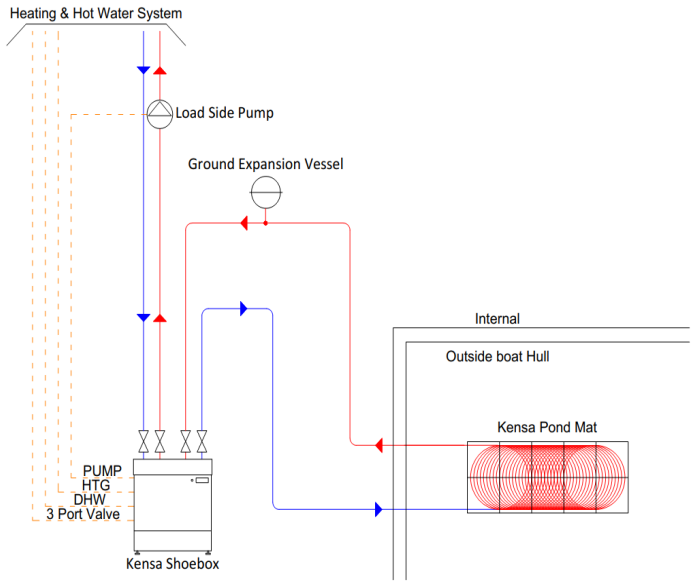
In an open-loop system, the water (from a river, lake, or sea) is pumped through a heat exchange, usually near the heat pump. A closed-loop antifreeze circuit connects the heat exchanger to the heat pump. These two circuits allow the energy from the water to be transferred into the heat pump with only maintenance required on the open-loop side.

Closed Loop

There are various types of closed-loop systems that have been installed with Kensa's heat pumps. The closed-loop heat exchanger must be located below the water level, it is important that tidal changes are taken into account as if the heat exchanger is above the water level at low tide, then there will be no energy available for the heat pump to work correctly.

One of the most popular closed-loop system is a pond mat. An antifreeze & water mix is circulated around a coil of pipe which is sunk to the bottom of the body of water. The coil of pipe is attached to a frame called a pond mat and will absorb energy from the surrounding water. The water source has to be sufficiently deep to avoid freezing around the pond mat and to avoid any damage from passing boat traffic. Pond mats are generally installed under a jetty next to the houseboat if there is space available. If the boat has permanent mooring, then the potential for using pond mats is a viable option, consideration must be taken into account as pond mats are not easily manoeuvrable and weigh in excess of 100kgs. Kensa would require a pond mat survey form to be filled out, in order to carry out a viability study.

Figure 1 Installation of Pond Mats



Schematic 2 – Indicative Pond Mat Layout

Here is an example of a pond mat being installed, in this instance the pond mat frame is put on blocks to keep it from being on the surface of the pond, this is to prevent the build up of silt and to maintain its position in the surrounding water.

Energy Blades Submersible Paneled Heat exchangers

Similar to pond mats, energy blades can be fixed in the water or potentially onto the boat to gather energy from the surrounding water.

Consideration must be given in regards the build up of debris or damage that may be caused by other objects, if necessary a floating cage may have to built to protect the blades. Further information can be found here: UK Exchangers - Submersible Panels
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Figure 2- Energy Blades prior to sinking below water level

Using the hull—Skin Tanks

The most common type of heat exchanger used on houseboats is where the hull itself is used as the energy extraction method, this is known as a skin tank . This system is common among boat builders as they often use this method to dissipate heat from the engine room into the hull and outwards into the water. A skin tank would usually have a second layer of steel on the inside of the hull that water and antifreeze would pass through and absorb the heat energy stored in the water.

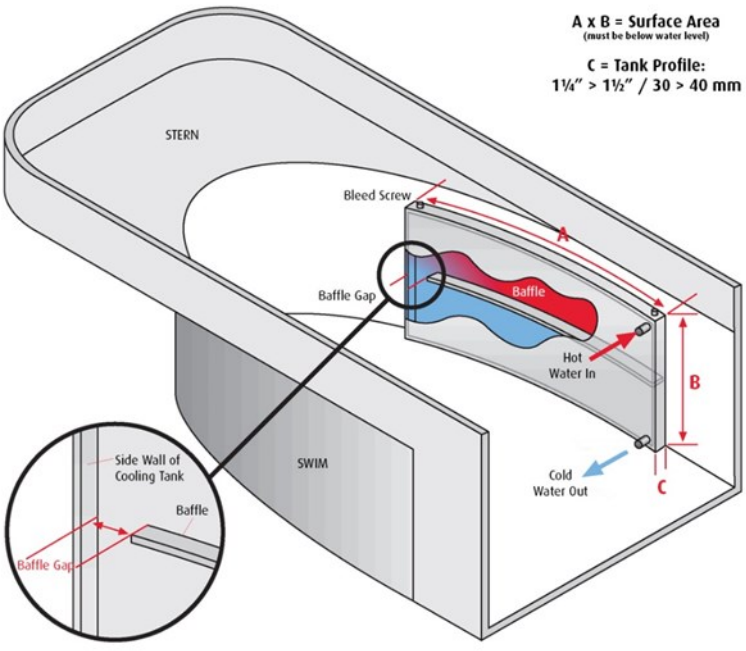


Figure 3—Example Skin Tank

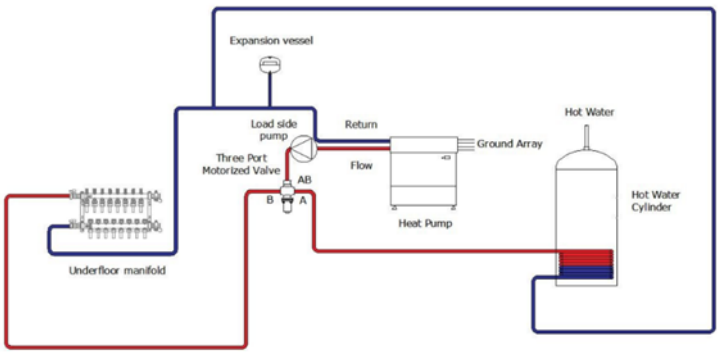
Skin tank baffles need to force the flow through the entire tank body, any gaps between the skin tank and the baffles will cause the skin tank to short cycle and not function correctly. Air vents are needed on the skin tank at the highest points to enable the tank to be completely purged and air free alongside a drain off at the lowest point. The location of the skin tank should be installed on a vertical section of the hull below the water line and should not be located on the baseplate of the hull. The fabricator or boat builder should be consulted for fabrication details.

As a general rule of thumb, you will need 0.5m² of outer hull area per kW of the heat pump output. For example, a 3kW shoebox will need 1.5m² of outer hull surface area as a minimum. The volume of antifreeze internal to the skin tank should be 22% mixture with 78% water protecting you down to -10°C. This is a closed-loop method that requires minimal maintenance. Prior to installing a skin tank please contact Kensas Installer Development Team to help with sizing.

Figure 4—Skin Tank being Installed

With all types of energy collectors, an expansion vessel is required on the closed-loop side, the location and sizing of this can be discussed with Kensa.

The most common Kensa Heat pump installed on houseboats is the Shoebox range. Due to having relatively low output of between 3kW & 6kW and requiring lower power supply of 16A and 25A respectively . The Shoebox range works well with all correctly sized heating systems and can provide a flow temperature of up to 50°c. For hot water production, the Shoebox heat pumps can provide 65°C. As with any heat pump, the lower the flow temperature the more efficient the system. As a manufacturer, we can collaborate with any heating engineers installing units on boats, the process is very similar to a domestic house installation from an installation perspective. An important consideration should be taken when installing our heat pump onto any houseboat due to the design of the compressor the boat must be level at all times.



Schematic 3 – Shoebox example installation within a house boat

A heating engineer should be consulted for any installation questions for installing the heating system onto a houseboat. Other than the location, installation and hydraulics are the same as a standard domestic heating system. The power supply to the product should also be checked by your installing electrician for the suitability. Technical information sheets can be found on our website for further product specification and details.