

# Closed Looped Open Water Source Heat Pump System

This is an ingenious way to harvest high volume low grade heat from the environment . Extracting 3 degrees Celsius from a water source can be magnified to much higher and useful temperatures for heating and hot water supply.



The most recent example of a practical application of this technology comes out of the UK. The Kingston Heights housing development receives over 2.3 megawatts of heating from an open water source heat pump system.

Energy from the sun is captured and stored in any body of open water. Because it is replenished every time the sun shines, it provides an endless supply of renewable energy. For the Kingston Heights development, water from the River Thames is pumped into equipment in the specially-built plant room adjacent to the river. This water passes through a heat exchanger, which transfers the low grade heat in the river water to an internal 'closed looped' water system before the river water is immediately returned,

## Scalable Solution

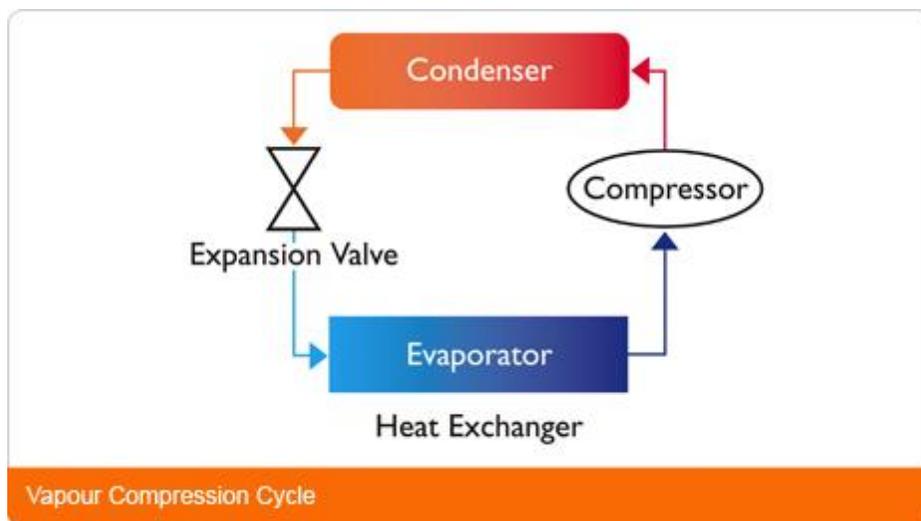
The community heating system will generate approximately 2.3 MW of heat output and an average of 75 litres per second will be abstracted from, and returned to, the Thames. This equates to 6.5 million litres per day – although the system's capacity is 13 million litres per day. The Thames flow rate is 260,000 litres per second so the maximum that the system could abstract is 0.05% of the available water in the river. The change in temperature of the water is at **most only 3 degrees** – a difference that would be assimilated almost immediately. Once the low grade heat has been

extracted from the river water, it passes into a secondary water circuit that links to a plant room on the fifth floor in the apartment block 200 metres away.

Forty one Mitsubishi Electric Ecodan water source heat pumps link to this internal 'closed' loop and increase the temperature of the low grade heat up to 45°C, before sending it to mini plant rooms right across the development. The inverter-driven Ecodan units offer a completely scalable solution for almost any ground or water-based community heating need and offer low maintenance, a small footprint and easy installation. Inside dedicated equipment spaces on each floor, the second part of the Ecodan heat pump system upgrades the temperature further to deliver underfloor heating and domestic hot water to the apartments.

### Vapour Compression Cycle

The heat pumps work by using what is known as the 'vapour compression cycle' to upgrade low temperature renewable heat and raise it to usable temperatures for the home. Inside sealed copper piping within the unit, refrigerant vapour is compressed to raise both the pressure and the temperature. This hot, pressurised vapour is then passed through a condenser, where it liquefies and gives off usable heat that is passed to the apartment's hot water supply and underfloor heating.



The liquid refrigerant is then allowed to expand, which lowers its temperature and pressure. This low pressure liquid then expands and absorbs naturally occurring heat from the renewable source - in this case the river. In doing so, the liquid changes back to a vapour, and the whole cycle begins again.

This is not a miracle solution to the problem of climate change, but it is an important breakthrough that could make a big contribution to lower carbon dioxide emissions. The technology requires a small amount of electricity for the pumps, but even if that

electricity comes from fossil-fuel sources the overall carbon output of the system is significantly lower than gas water heating, for taps and central heating, and the cost is 20 per cent lower.

### **Political Accolades**

Secretary of State for Energy & Climate Change (UK), Ed Davey praised heat pumps at a recent conference informing his audience how they had helped some social housing residents cut their bills in half. “At the moment, most heat is delivered by burning fossil fuels. As we’ve seen in the last year – when the cost of gas soared, pushing up energy bills – that leaves our consumers exposed to volatile global markets. ”

Source: <http://revolution-green.com/closed-looped-open-water-source-heat-pump-system/>