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Fact Sheet – UK Domestic Hot Water & Kensa Compact Heat Pumps

All Kensa heat pumps can be configured to heat DHW (Domestic Hot Water). The success of heat pumps at heating DHW varies enormously – from miserable to good - and depends upon such factors as :

1. Type of heat pump control system - software, electronic or mechanical
2. Type of DHW control system - tank thermostat, pipe thermostat or sensor
3. Water flow rates
4. Refrigerant type - traditional HCFC/HFC or HC's
5. Refrigerant circuit type - single or twin DHW condensers or *desuperheater*
6. Tank type - calorifier or direct
7. Tank efficiency - surface area to tank volume ratios of calorifier coils
8. Ratio of tank volume to heat pump heating capacity
9. Heat source - closed or open loop
10. Quantity of DHW required per day
11. Temperature of heat pump source
12. Target temperature of DHW
13. Future legislation with regards to Legionella

The main reason that people want to use a heat pump to heat DHW is that they think that it will save them money. Often, this is because they are used to a boiler that provides both space and DHW heating, and want a heat pump to simply replace the boiler.

Many have not done some simple calculations. For example, it is cheaper to use off-peak electricity to heat hot water than to use an oil-fired boiler. No-one should really be using an oil fired boiler for any purpose in the summer months in the UK as this would be more expensive than using the immersion heater in their hot water tank with a time clock.

When heating Domestic hot water (DHW), non-condensing oil-fired boilers are rarely running at more than 50% efficiency, and using them in this manner can shorten their life, as acidic condensation is able to run down from the flue into the heat exchangers and cause corrosion.

On off-peak tariffs (SSE Economy 10 Tariff - see separate fact sheet) there are three bands of cheap-rate electricity during the day, so that three tanks of cheap hot water can be provided.

It is reasonably straightforward to calculate the size of a space-heating appliance for a new UK building because in order to comply with the current building regulations, it should not need more than about 50 Watts per square metre of peak heating requirement. The only other factor that needs to be taken into account is the amount of time that the heating system needs to run, often referred to as *degree days*, which will vary geographically.

DHW demand can vary greatly, depending totally upon the occupants of a building and is therefore much more difficult to quantify than space heating - so assumptions must be made. Most ground source heat pumps use a *closed-loop* ground array system, such as Slinkies or boreholes that use the ground as a solar battery. This is an exhaustible source of heat energy that needs to be recharged via ground water (rainfall) or during the warmer summer months.

Designing a system that takes account of the variation of DHW use and also the ground battery effect is much more complex than for space heating, and is a compromise.

As buildings become better insulated, the ratio of space heating to DHW capacity is reducing. There are already some small houses where the annual DHW demand exceeds the space heating requirement and this is predicted to be increasingly the case in the future. What is often forgotten, which offsets this, is that target indoor temperatures are rising – from 16 degrees 50 years ago to often in excess of 21 degrees now.

Designing a heat pump system for both DHW and space heating is a complicated matter that involves assumptions, compromise and a specialist experienced consultant designer.

However, in recent years a new competitor for using a heat pump to heat DHW has emerged: Solar Panels. Modern solar panels, it is claimed, can provide between 60% and 95% of DHW requirement in the UK.

Heat pumps can be used to provide the balance of DHW that the solar panels cannot supply, but there is a major economic reason that negates this ability, besides the practical engineering difficulties in designing and sizing such a system. When the sun does not provide sufficient heat for the solar panels to provide all the DHW, these are the coldest days of the year. During these cold days, the heat pump will use all of the off-peak electricity for space heating, leaving only peak electricity, at roughly three times the cost, to run the heat pump to provide DHW. A simple and cheap electric immersion heater will heat the DHW using off-peak electricity on these occasions for approximately the same cost as running the heat pump. During the summer, the heat pump can now offer no real competition for modern solar panels.

The heat pump also costs money to run and will often only achieve 50 deg C. Solar panels will achieve much higher temperatures and cost nothing to run.

There is another more practical reason for not using heat pumps to heat DHW and that is one of installer complexity. Kensa's *Compact* heat pumps are specifically designed to be installed by someone with no prior knowledge or training. As soon as there is a requirement to integrate a heat pump with a DHW system a much higher level of installer competence is required. It is much more difficult to install such a system and much more difficult to troubleshoot any problems that may arise because of errors in the installation.

Kensa Engineering Ltd. recommend that solar panels should be used to heat DHW, and this should be supplemented with an off-peak immersion heater on the coldest months.