Application Information Sheet

Heat Pumps and Swimming Pools

Facts at a glance:

Outdoor Pools
Outdoor pools are generally only used in the summer so an air source heat pump or solar thermal is the most efficient method of heating.

Indoor Pools
Due to their all year round usage, for indoor pools ground source heat pumps are more suited and offer higher efficiencies than air source.

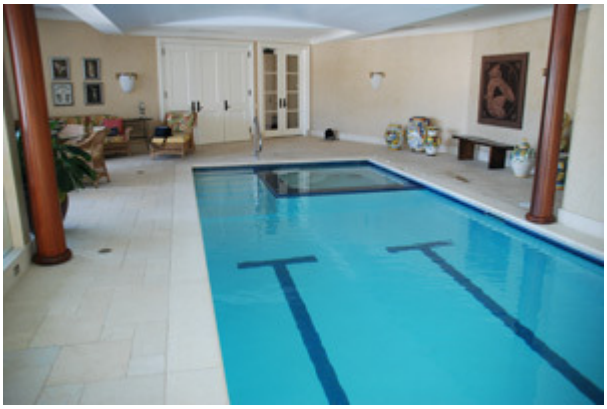
Heat load
The pool's heat losses are critical to the size of the heat pump required. Therefore excellent insulation around the pool and pool building is very important. The heat load should be specified via a swimming pool specialist.

Condensation
As well as the swimming pool load it is important that the dehumidification load is also taken into account. This can be via the heat pump or a secondary heating system.

Ground Arrays
Due to the all year round demand, with ground source heat pumps the number of ground arrays for an indoor pool have to be at least doubled.

Larger heat exchanger
To avoid corrosion problems due to the chlorine an intermediate heat exchanger is required. The lower delta T from the ground source requires a larger heat exchanger than for a traditional boiler.

Many people are looking to reduce the amount of energy and hence costs of running a swimming pool and are looking for the heating to be provided by a heat pump. Heat pumps are actually very good at heating swimming pools however there are a number of issues which need to be considered.



1) **Indoor or outdoor**—If the pool is an outdoor pool then generally it will be only used in the summer. If this is the case efficiency wise it would be much better to use an air source heat pump (as the air source temperature is generally higher than the ground temperature) or solar thermal. With an outdoor pool the losses to the atmosphere are difficult to gauge and advice should be sort from the designer of the pool. Highly efficient pool covers should also be used. Indoor pools are more likely to be used all year round and in these cases the year round constant ground temperature makes ground source heat pumps a more efficient choice.
2) **Pool insulation**—The heat losses of the pool depend on the how well insulated it is and with a new pool this is easy to specify, however for an existing pool it is more difficult to determine and the insulation may also be waterlogged. The heat load should be calculated by a pool designer with these considerations in mind. As a guide for a well insulated new swimming pool the load of heating the water (excluding any dehumidification loads) can be calculated by using the guide of 1kW per 5 cubic meters of water.
3) **Condensation**—If you have an indoor swimming pool then maintaining the correct humidity of the air in the pool room is essential, without this water will very soon soak in to the floor, walls, roof, and window frames causing corrosion, wood rot, mould and bacteria growth and an unhealthy environment. To control this, a swimming pool dehumidifier is required. There are many things to take in to consideration when specifying a swimming pool dehumidifier. The starting point is the surface area of the swimming pool. From this

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an estimate of the litres per day of water vapour produced can be determined. As an initial guide with a heat pump, the heating load is halved and then added to the heat pump sizing. The hot water produced by the heat pump is then split between the pool heating and dehumidification plant. It is important to ensure that the de-humidification equipment selected is sized for the correct temperature of 35-40°C coming from the heat pump and not 82°C which most 'off the shelf' units operate at. The dehumidifier fan should also be larger.

4) **Ground arrays** - Most indoor pools are used year round and require heat all year round. A Ground Source heat pump array used to heat a house would usually get a complete rest from May to September when the heating was off. An array supplying a pool does not get this, so it never gets chance to recover. It is therefore essential that the ground array is sized for an all year round demand, as a minimum it should be at least twice the size as that required for a domestic heating system.

5) **Heating the pool water**—Pool water usually contains chlorine, which is corrosive to heat exchangers and pipes - standard heat pumps are not rated to handle pool water and must not be used for this purpose. It is therefore necessary to put a heat exchanger between the heat pump and pool water, these are readily available, BUT, most are designed to operate at a delta T (temperature difference) of about 50degC (30C pool water / 80°C boiler water). These are no use for a heat pump, which wants to run at the lowest possible temperature with a 5degC delta T. A heat exchanger of this kind is much larger and more expensive than a standard boiler type, but this is not difficult to get right.

6) **Separate unit from the house heating system**—It is normally recommended that if a heat pump is used to heat a swimming pool, this system is kept completely separate from the house heating system. This keeps the systems simple and avoids the possibility of the swimming pool heating draining the energy within the ground for the house heating leaving the occupants cold. Any issues with the pool heating system will also not impact on the house heating.

Illustration of a ground source heat pump in a swimming pool application.

Please note : the drawing below is provided as an illustration only and should not be used as an installation drawing.