How to Properly Size a Pool Heat Pump

Most unheated swimming pools may be too cold to swim in cool climates, even in summer. For example, an unheated swimming pool in Sydney may reach 18-22 degrees Celsius, below the ideal temperature for swimming. Therefore, selecting the appropriate size of the pool heat pump is crucial. Whether you are purchasing your first pool heat pump or replacing an old one.

Heating or warming up a swimming pool with a pool heat pump is different from heating or warming it up with a traditional pool heater. What are traditional pool heaters? These are your electric pool heaters and heaters that use gas. The main difference for these types of heaters is that with your traditional pool heaters, they're actively producing heat to warm up your pool, which is why their output is measured by BTUs (British Thermal Units). Pool heat pumps on the other hand simply transfer the heat from the air to your water, so computations and numbers like BTUs can be a little bit "off" as it is directly affected by the temperature of the air. The colder the air surrounding your heat pump, the less heat is being transferred to the water and vice versa.

What measurement is used? In pool heat pumps, two values that we must take note of are the COP and the kW output. These two numbers, coupled with the air temperature can give you a good picture of how much power and time is needed to heat up your pool.

COP stands for Coefficient of Performance, which basically just means how much heating is transferred to your pool for every unit used. For traditional heaters, this number is around 0.75 which means that for every 100 units of energy used by the heating unit, only 75 gets transferred to the pool water and the 25 is lost. While 75% energy transfer sounds "ok", it pales in comparison when compared with the energy efficient pool heat pumps from SUNRAIN. How so? Well, the average COP of the residential pool heat pumps can be anywhere from 6.8 to 16! This means that for every 100 units of energy that are consumed by the unit, 680 to 1600 units are transferred to the pool! Talk about efficiency?

How large should my heat pump be? Without getting too much into the scientific computations, the easiest way to do this is that it takes 1.16 W/h to heat one litre of water up by one degree. Taking this number, we know that it takes 11.6kW/H to heat up a 10,000-litre pool by one degree Celsius in an hour. You may think to yourself, wow, that looks like a lot of power, and yes it does look like it until we apply the COP factor. We're only using 1.014KW/H because of the COP factor (Output divided by the COP Factor (SUNRAIN's average 16 to 6.8 kW divide x 2 = 11.4)

To further simplify things, we have created a table that can give you an idea of how fast (or slow) different sized pool heat pumps can raise the temperature of your water so that you can have a rough idea of the size you'll need to raise your pool temperature by 1ºC/H (Summertime Ambient temperature >20ºC. For colder climate/wind allow more heat pump run time or use a larger heat)

Some things to consider While it may sound like a good idea to get something small to save on the upfront costs, it is worth noting that unless you have a pool cover, your pool can lose up to 2ºC overnight! So, it is always good to pick a pump that will take a maximum of 4 hours to raise the temperature by 1ºC so that we can maintain overnight water temperature and we can consistently maintain perfect swimming temperature throughout the swimming season.

What to get for your pool Find the volume of your pool and pick a heat pump model with heating increase of 0.25ºC/H or above. The higher the number, the faster your pool heats up. For example, if you have a 70,000L pool then the minimum recommended size would be for the 21kW model (0.27ºC per hour). If the exact size / wattage isn't available, pick the next size UP, in this case the 28kW would be better for cold climate.

Volume	13kW	17kW	21kW	28kW	35kW
10,000L	1.15	1.51	1.88	2.45	3.1
20,000L	0.58	0.76	0.94	1.23	1.55
30,000L	0.38	0.50	0.63	0.83	1.03
40,000L	0.29	0.38	0.47	0.63	0.78
50,000L	0.23	0.30	0.38	0.50	0.62
60,000L	0.19	0.25	0.31	0.42	0.52
70,000L	0.16	0.22	0.27	0.36	0.44
80,000L	0.14	0.19	0.24	0.31	0.39
90,000L	0.13	0.17	0.21	0.28	0.34
100,000L	0.12	0.15	0.19	0.25	0.31
120,000L	0.10	0.13	0.16	0.21	0.26
Commercial	70kW	103kW	136kW		
120,000L	*0.51*	*0.75*	*1.00*		
200,000L	0.31	0.45	0.60		
300,000L	0.21	0.30	0.40		
400,000L	0.15	0.23	0.30		

Initial Heat-up times This is where pool heat pumps throw in the towel versus traditional pool heaters. Pool heat pumps will take a while to heat up the pool to the desired temperature so some planning will be required on your part. So aside from making sure that your pool heat pump will be able to overtake the heat loss during the night, the overall size of your unit will be vital in how fast your pool heat pump will heat up your pool to comfortable levels.

Maintaining water temperature Don’t get scared of getting oversized pool heat pumps, once your water gets to the required temperature, it only takes a little bit of energy to maintain your temperature (see table) so depending on the pool size and heat pump size, it will only take a few hours of operation to maintain your pool water’s temperature at a comfortable level.

Notes:

1. A pool thermal blanket must be used. Pools without a thermal blanket on, or pools that will be uncovered for most of the day, could require heat pumps more than double the size calculated. The higher the required pool temperature is above the ambient temperature and the more wind over the surface of the pool, the greater the energy required.
2. Summertime use is defined as September to March pool use,
3. A pool filtration pump run time (heat pump run time) up to 12 hours per day. For a shorter daily runtime, the heat pump size should be increased ideally 4 hours.
4. A 15°C water temp increase implies that if the unheated pool is, for example, currently at 16°C, the heat pump will heat that pool to 31°C (16°C + 15°C).
5. Inverter pool heat pumps only become more efficient than standard heat pumps when not running at 100% output power. Therefore, we recommend going as big as the budget or power connections allows for.

What is the difference between Inverter and a standard On/Off Heat Pumps? The energy needed to maintain a certain pool temperature varies greatly with a change in ambient temperature and with air movement (wind) over the pool surface.

A fixed output heat pump can only be On or Off. When turned on, the fixed output heat pump works at 100% capacity to meet the heating demand of the pool. It will continue to do this until the desired pool temperature is met and will then cycle between off and on to try and maintain this temperature.

An inverter heat pump, however, uses a variable speed compressor which modulates its output, increasing or decreasing its output power to match the exact heat demand requirements of the pool. When the demand is low the heat pump will reduce its output, limiting the electricity usage and the exertion placed on the heat pump's components and limiting the start-up cycles.

A well-designed standard pool heat pump system will provide an average coefficient of performance (COP) of around 5. This means that for every 1kW of electrical energy used to power the heat pump it will return 5kW of heat energy. With an inverter pool heat pump, it is possible to get COP values of more than 12! Some marketing material shows values much higher than this, but it is important to know that the COP value is dependent on the ambient temperature. It is also important to know that inverter heat pumps will give you the same COP value than a standard heat pump when operated at 100% output capacity. It is only when an inverter heat pump "backs off" it's output power that the efficiency starts to increase.

Let's assume a client would like their pool to always be 28ºC – even during a worst-case winter ambient temperature of <0ºC. Let's also assume that for the specific pool size a 17kW full inverter heat pump will be able to fulfil this requirement when operating at 100% output capacity. When the ambient temperature is <0ºC (running at 100% output capacity) the inverter heat pump will not provide a greater electricity saving than a standard heat pump. However, when the ambient temperature increases and the heat pump does not need to run at 100% output capacity, the inverter heat pump will become more efficient and can provide a significant electricity saving advantage. At ambient temperatures of 18ºC the inverter heat pump could already have reduced its output power to 30% and use less than half the electricity of a standard heat pump. From this it should be clear that a correctly sized inverter pool heat pump can provide a significant saving in electricity consumption when compares to a standard pool heat pump.

SUNRAIN *(Stock code 603366) as China biggest supplier of heat pump and hot water system, is a high-tech company which specializing in researching, manufacturing and marketing of renewable products.*

Sunrain heat pump has got the ISO9001, ISO14001, ISO18001, CCC certification, CE, ROHS, CB, UKCA, MCS, KEYMARK, BAFA list, SG Ready Label certification etc. Sunrain has spent nearly 10 million RMB to build the most advanced labs which can test from small heat pumps to commercial heat pump up to 300KW.

Sunrain always treasures the product quality and builds a perfect quality management system. It controls the whole process of heat pump developing, testing, production