

Air Source / Air to Water Heat Pumps

Air Source or Air to Water Heat Pumps extract heat from the outdoor air and exchange this heat with the indoor heating system e.g. under floor heating and radiators. To understand Air Source Heat Pumps better we first need to understand the heat pump principle.

Heat pumps contain a refrigerant gas that provides a conducting medium between the outdoor heat source and the indoor heating system. On the external side of the heat pump (evaporator), liquid changes state to a gas and it absorbs a lot of heat in the process. When the refrigerant gas reaches the internal side of the heat pump (condenser) via the compressor, it changes state back to a liquid, giving up heat in the process. This heat is passed to the internal heating system via a heat exchanger.

The efficiency of an Air Source Heat Pump is affected by the outside air temperature i.e., the higher the outdoor temperature the better the performance ratio of the Heat Pump. In Ireland the lowest average seasonal temperature in Winter 2007/08 was +5.2 degrees and in Winter 2008/09 was +4 degrees (source: Met Eireann, www.meteireann.ie). The general perception is that the average temperature is in fact much colder than this, demonstrating that perception and reality with regard to Irish weather conditions can be considerably different.

What to look for when selecting a Heat Pump

There are many factors which need to be considered when selecting an Air to Water Heat Pump to ensure optimum performance. These factors relate to the Heat Pump itself and also the application for which the Heat Pump will be used.

The measure of the performance of any heat pump is the Coefficient Of Performance (COP). If a heat pump uses one kilowatt of input power with a COP of 3:1, it provides 3 kilowatts of output energy.

The flow (output) temperature of the heat pump to the heating system is of significant importance. The lower the flow temperature, the better the Coefficient Of Performance (COP). Under floor heating if designed and implemented correctly is the best complement to a heat pump as it operates at a lower temperature than other heating delivery systems.

Refrigerants used in Heat Pumps vary across different manufacturers and models. R410a is recognised currently as the best performing refrigerant in use in domestic heat pumps

The compressor is the heart of the Heat Pump and is key to the efficient performance of the device. High pressure scroll compressors are the most efficient design available on the market today.

Some Heat Pumps have fixed speed output while some contain an Inverter or Variable Speed Drives (VSD's) which allow the pump to respond to variable heat demand. In the north-west European climate where temperatures can vary considerably even on a daily basis, it is important that an Inverter is used. This allows more efficient operation of the heat pump.

Air Source Heat Pumps require a defrost cycle at various intervals due to the build up of frost on the air heat exchanger. An Inverter driven unit can increase the fan to maximum speed to make the defrost cycle as short as possible. Reducing the duration of this defrost cycle is critical as the pump cannot provide heat when it is defrosting.

Weather compensation is a method used on some Air Source Heat Pumps to allow it to input the correct amount of energy into the dwelling. This increases efficiency especially when used in combination with a VSD.

Other Factors to Consider

Noise emissions from Air Source Heat Pumps can vary considerably. The common measure is Decibels (dBA). When examining this noise data, note the distance at which the noise emissions have been measured e.g. 1 metre, 3 metres etc

Domestic hot water storage is often forgotten in the equation. Domestic cylinders and thermal stores require sufficient heat exchange coil sizes to allow proper performance. Cylinders also require excellent insulation to retain heat.

Air Source Heat Pumps can raise hot water to 55-60 degrees. The requirement to produce hot water is driven by the consumption. Every dwelling uses hot water differently. Some households need hot water throughout the day or at defined time periods. Occupants can take showers which require less and lower temperature hot water than baths.

System controls are important to allow the heat pump to interface with overall heating scheme in a domestic dwelling for space heating and domestic hot water production. Flexibility of the controls is important as a dwelling can have a variable number of inhabitants over a number of years and the number of hours spent at home can vary considerably over time.

The F-gas regulation has come into effect since 6th July 2006, with many of the stipulations effective from 6th July 2007. Any heat pump containing 3kg or more of refrigerant will require an annual inspection that will incur a cost for the home owner.

Payback Analysis

When selecting a Heat Pump solution for your home it is worth analysing the cost of purchase and installation i.e. capital cost against the annual running cost i.e. operational cost. This will allow a payback period to be calculated. Any competent supplier of Heat Pumps should be able to provide these calculations to ensure that your investment is money well spent. When examining payback, it is worth considering the quality and durability of the selected technology so that you can be confident that the solution will continue to function effectively, long after the estimated payback period has expired.

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