SUSTAINABLE BUSINESS

GROUNDWORK CHANGING PLACES CHANGING LIVES

RacetoZero

This factsheet has been prepared by Groundwork to help businesses on the race to Net Zero.

AIR SOURCE HEAT PUMP (ASHP)

Air source heat pumps are renewable energy generating technologies which use thermal energy from the outside air into a building to provide space heating even with external temperatures as low as -15°C.

An air source heat pump is slightly larger than an air-conditioning refrigeration unit. They are located outside the buildings and connected to an inside unit through the wall.

WHAT IS AN ASHP?

They offer hot air or hot water. Using much less energy than a traditional boiler, the hot water can be utilised for residential hot water (showers, etc.), underfloor heating, or large radiators.

Building spaces can be heated directly by warm air. A heat pump will produce 2-3 units of heat for every unit of power, compared to a standard immersion heater's one unit of heat per unit of electricity.

Heat pumps need electricity to run, and each unit of electricity produces a great deal of heat energy than it consumes (this is known as the "coefficient of performance," or COP). If a fossil fuel is used to generate the electricity, this qualifies as a low carbon technology. To be considered a renewable technology, the heat pump must be powered by a renewable electricity.

HOW DOES AN ASHP WORK?

Similar to a refrigerator, but on a much greater size. Heat is transferred from a refrigerator's inside to its radiator at the back. A similar process is used by air source heat pumps, which transfer heat from the air to a hot water source.

The components of a heat pumps consist of a fan and a heat exchanger. Air is drawn over the heat exchanger by the fan, and heat from the air is transferred there. Even when it is nearly freezing outside, heat may still be drawn from the air.

SAVINGS CALCULATION

AN EXAMPLE SAVINGS CALCULATION FOR A BUSINESS

(Based on electricity prices in 2020)

The business uses a mix of electricity powered heating systems. On the first floor mainly storage radiators are used whilst on the ground floor a 12kW electric boiler is used heating a traditional hot water radiator system. Hot water is provided from an insulated cylinder with an immersion heater installed. The storage radiators are old, and the controls may lead to some inefficiencies.

Action 1	**Cost Savings** (£/year)	**kWh Savings**	**CO2e savings** (tCO2e/year)	**Capital Cost** (£)	**Payback Period** (years)
Replace current electric boiler and storage heaters with Air Source Heat Pump and additional radiators and use heat recovery fans	£2,444	16,131	7.3	£13,900 (heating) and £5,600 fans = £19,500	8.0

Extraction rates taken as 360cu M per hour for 6-inch fan and 795cu M per hour for a 9-inch fan.

If the business installs 3 * 9-inch fans, air on average would raise the temperature by 7°C. So, the energy required to raise the temperature of 1 cu M of air would be 0.34watt.

Fans usage for 9 inches would use 5.5 hours per working day and 6inch would use 9 hours per working day.

Additional heat required above historical levels is 9745kWh.

Using conventional convector heating the total heating required will be 20786kWh costing £3149 at day rate.

Using extractor fans and a heat pump the heating load drops to 13964kWh.

This requires 13964/3 kWh of electricity = 4655kwh with a cost of £705

THINGS TO BE CONSIDERED

An air source heat pump will be less effective in the winter when the air is colder since the air does not store heat for as long as the ground does.

Moreover, noise might be a problem because external fan units can produce a lot of noise, which can be made worse if the pump is not installed properly.

Consider planning permissions from the local authority before installation.

It is important to consult with a qualified installer to discuss your specific needs and to get an estimate for the cost of installation.