Understanding Air Conditioning...

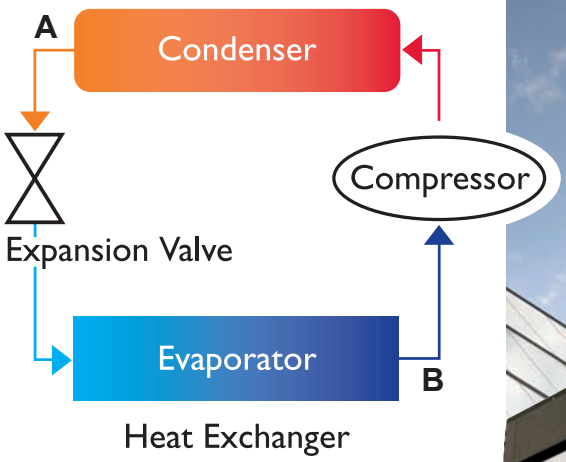
An air conditioning system treats the air in a building making it more comfortable for occupants. The main function is to provide comfort cooling and heating by transporting energy from one part of a building to another or to outside. Air conditioning is different from ventilation, which simply brings fresh air into a building from outside.

How does it work?

Mitsubishi Electric focus on 'Direct Expansion' systems which provide comfort cooling and heating via energy transfer directly with refrigerant.

Basic Refrigeration Cycle

The main parts of this system are: the compressor, the condenser, the expansion device and the evaporator which are housed in either an indoor or outdoor box. These boxes are connected together using two sealed copper pipes. A fluid called refrigerant travels around this sealed system continuously. The refrigerant changes state from liquid to gas and vice versa at different temperatures. As it changes state, it will either absorb or reject heat energy (which is how energy is transferred into or out of the building)



The Cooling Cycle

The refrigerant starts as a high pressure liquid in position A. This liquid travels from the outdoor box through an expansion device, where it turns into a low pressure, low temperature liquid. The low temperature liquid flows through the indoor box or evaporator where it absorbs heat energy from a hot room and therefore provides a cooling effect. As the refrigerant absorbs this heat, it 'boils off' into a low pressure gas or vapour at Position B (n.b. the boiling temperature of a refrigerant is much lower than that of water)

This low pressure gas is sent back to the outdoor box where it is pumped through the compressor in order to increase its temperature and pressure. This refrigerant then releases the heat energy into the cooler outside air. As the refrigerant discharges this heat energy, it turns back into a high pressure liquid (by condensing).

The Heating Cycle

In order to provide heating to a room instead of cooling, the system switches into reverse and absorbs heat from outside air and passes it into the indoor box. This type of system is called a reverse cycle heat pump and is very poplular and highly efficient for the UK market.

MITSUBISHI ELECTRIC
AIR CONDITIONING SYSTEMS

"There are many different types of air conditioning system, which use various methods to cool and heat air and then move it around the building"

August | 2008

Mitsubishi Electric provide the following:

Split Direct Expansion (DX) Cooling or Heat Pump Systems

These are known as split systems because the condenser is housed in an outdoor unit, whilst the evaporator is in an indoor room unit, usually mounted on the ceiling or wall. Two pipes connect the two units and contain a fixed amount of refrigerant. A multi-split system connects a number of indoor units to a single outdoor unit – giving more flexible design possibilities.

VRF: Variable Refrigerant Flow

In a VRF system, the temperature of the air is controlled more accurately by altering the amount of refrigerant to each indoor unit in each room. The system automatically monitors temperature requirements and increases or decreases the flow of refrigerant according to requirements. VRF is an extremely energy efficient form of air conditioning as it can alter the system operating level to exactly what is required at any particular time. In a VRF multi-split system, it is possible to move rejected energy around a building to where it may be required, i.e some indoor rooms may need cooling, whilst others may require heating (think of a hotel with lots of different occupants). VRF uses the spare heat energy from a cooling room to warm a neighbouring area in the building. This is a particularly energy efficient approach to heating and cooling a building.

Inverter

Mitsubishi Electric uses inverters on all of its air conditioning systems. The inverter varies the compressor speed in order to match the exact cooling or heating requirements. This ensures that energy wastage is kept to a minimum. Systems are highly efficient and have a low carbon footprint.

Refrigerant

A liquid which evaporates very easily at low temperatures. They must have low flammability and be non-toxic. They are also the subject of environmental regulation as refrigerants in older air conditioning systems were considered damaging to the ozone layer if they escaped from the system. However this is not the case for modern, environmentally friendly refrigerants which have zero Ozone Depleting Potential.

Other Systems:

VAV: Variable Air Volume

VAV controls the temperature in a building by varying the amount of air entering the space. VAV systems tend to be more used in the USA than in the UK and are considered less energy efficient than VRF systems.

Chillers, Chilled Beams and Low Pressure Hot Water (LPHW) Fancoils

Both systems use a chiller and/or boiler to cool or heat water and then pipe it around a building into emitters. The entire system is only as efficient as the chiller it is connected to. Chillers are not fully inverter driven and therefore may not be as efficient as more modern inverter options.

Chilled Beams

As warm air from the office space rises, it moves across the beam and is cooled. Chilled beams are considered energy efficient and low maintenance because they have very simple mechanics. However, offices which use a lot of IT equipment can sometimes produce more heat than chilled beams can deal with.

Low Pressure Hot Water (LPHW) Fancoils

These systems were popular in the UK for many years but are considered complicated to control and slow to respond for modern day office applications.

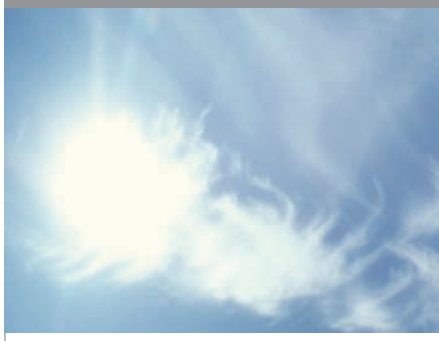
Displacement Ventilation

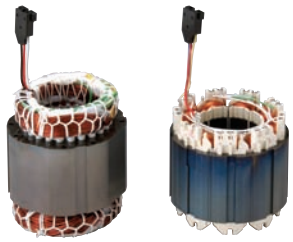
Displacement ventilation relies on the fact that warm air rises upwards. In a displacement system a large volume of air is introduced from outside into the building at very low speeds – so that occupants don't feel it. As this air heats up it gradually rises and leaves the building usually through ventilation areas in the roof. It is often used in large open spaces with high ceilings such as airports and theatres. These types of systems are often supplemented by splits or VRF in order to cope with higher heat gains.

Packaged Rooftops

These are a single system in one 'box' which cools and filters the air before transmitting it around the building via ductwork. They are popular in large, undivided spaces such as supermarkets and cinemas (particularly in the USA). Packaged solutions will only provide one temperature solution to an entire space and are a 'cheap and cheerful' option.

ALL Mitsubishi Electric Split, Multisplit and VRF systems use inverter driven compressors which make them very energy efficient.





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