

## HVAC System - Heat Pumps

### What are Heat Pumps?

Heat pump is a sort of HVAC system that can deliver both heating and cooling to the building. It practices mechanical energy that helps in eliminating heat from the air and shifts it either indoor or outdoor depending on the temperature require inside whether heat or air conditioning according to the climate outside the building. These heat pumps are considered to be very efficient and user friendly as they do not need to burn any fuel for production of heat.

Now a day, heat pumps are also used to heat the water for domestic use, for kitchen, bathroom and also for washing clothes. They are considerably more efficient than conventional “electrical resistance heaters”. Following terms are usually considered while talking about the heat pumps efficiencies:

- “Coefficient of performance (COP)”
- “Seasonal coefficient of performance (SCOP)”
- “Seasonal performance factor (SPF)”

As long as these terms have high numbers, the efficiency of the heat pumps is considered to be higher, which means less amount of energy is consumed by heating pumps, ultimately making it the most cost effective system to operate. In addition to these, there are other factors too that affect the efficiency of heat pumps such as:

- Technology used
- Auxiliary equipment
- Size of heat pumps
- Implemented control system
- Humidity, climate and temperature

### Operating Principle of Heat Pumps

Heat pumps work according to the science implemented in refrigerators. As heat pumps are used to deal with high stream of energy therefore, fans and pumps are needed.

### Working in Air Conditioning Mode

Heat pumps on being installed properly, provide a comfortable, cool and relaxing temperature by reducing the humidity inside the building/ home.

- At first, the hot air inside the building is thrown out in the ductwork using motorized fan.
- Heat pumps make use of physical characteristics of unstable “evaporating and condensing” water which is termed as refrigerant.
- This refrigerant is compressed by the heating pumps that makes it hotter from the sides to get warm, and discharges the compression at the point where heat absorption is occurring.
- Compressor revolves the refrigerant among the outdoor condensing system and indoor evaporating system.
- The hot indoor air moves to the air handler. Meanwhile, outdoor condenser coil pumps the refrigerant into the indoor evaporator coil. Hence, on passing through the indoor air, refrigerant keeps on absorbing the heat from inside the system.
- The cool air is then moved to the air vents by the connecting indoor pipes all over the home or building, which in return decreases the temperature of the building.

- The cycle keeps on repeating continuously that helps in sustaining the cool temperature inside.

### Working in Heat Mode

Heat pumps work very efficiently at the places where temperature is high to cool down the temperature inside the building but with the advancement in technology, it can also be used for opposite scenario i.e., as a heat source.

- Air conditioning mode can be switched to heating mode by reversing the methodology of refrigeration cycle, creating and making use of outside coils for evaporating purposes and inside coils as condensing functions.
- The refrigerant propels by the closed loop system of refrigeration pipelines between the indoor and outdoor unit.
- Though the temperature outside is cold, still an adequate amount of heat energy is absorbed from the air outside by the help of condensing coils which are then discharged at the interior using the evaporator coil.
- Cold air from inside the building is thrown out in the ductwork using motorized fan.
- Interior coil pumps the refrigerant to the outer coil, here heat is then absorbed from air.
- Inside temperature is increased by pushing the hot air by the help of connecting ducts to the air vents all inside the home.
- The hot air is then moved to the air vents by the connecting indoor pipes that are spread all over the home or building, which in return increases the temperature of the building.
- The cycle keeps on repeating continuously that helps in sustaining the hot temperature inside.

### Advantages of Heat Pumps Over Gas Boilers

There are several advantages of heat pumps over gas boilers in so many terms which are listed below:

- Heat pumps are much reliable and safe to use as compared to the conventional boilers that use combustion process for cooling and heating purposes.
- Heat pumps are cost effective for saving energy as compared to boilers that run on oil and gases.
- Heat pumps lessens the carbon emissions and efficiently converts the energy into heat without any harm to the environment.
- Heat pumps requires less maintenance as compared to conventional gas boilers.
- Besides working as, a heating unit, it also provides cooling in summer times, working efficiently as air conditioning unit.
- Heat pumps can last up to 50 years that makes the system most reliable and robust source of heat.
- It can be cost effective if payment is done under “Renewable Heat Incentive (RHI) scheme” provided by the government.

### References

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