HVAC System Components Made Easy

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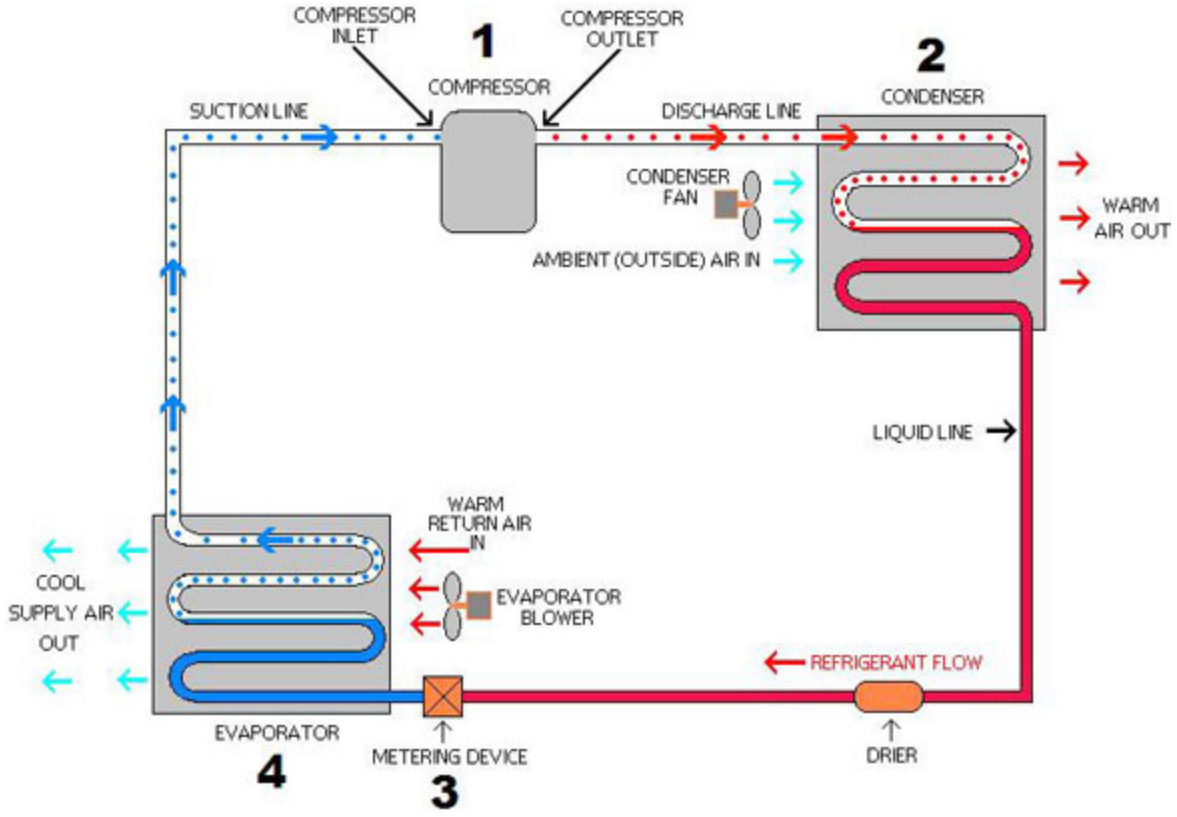
Do we need to know about **HVAC** system components? Well, HVAC systems are intended not only to adjust the thermal conditions of an area (mostly indoor), but they also bear the responsibility of delivering clean air to provide comfort in the environment when needed. Therefore, it would be quite beneficial actually to know some basics about their components, not only to appreciate the engineering art put into them, but also to be able to identify easier what might your system need to work as you wish.

Linquip can help you easily find the solution to meet your HVAC requirements. We invite you to read along to learn with us some information about HVAC system components.

HVAC System Components Diagram

In the following diagram, you can find some major components that concern pretty much all HVAC systems. There are, of course, differences between different HVAC system configurations, but the core concept and HVAC components are basically common among all of them. The following diagram shows a working cycle in an HVAC system, that could be intended for both heating and cooling applications by changing where the heat is absorbed from and where it is rejected to.

HVAC stands for Heating, Ventilation, and Air Conditioning; therefore, the design of such systems is mostly accompanied by some air ventilating and cleaning processes that are integrated with these systems.



In the following sections, we will take a closer look at the major components of HVAC systems.

Thermostat

The temperature sensor on a thermostat indicates when the heater or air conditioner should be running or turned off. There could be various thermally controlled zones, each of which require their own thermostat. The thermostat must be located somewhere as far as possible from areas of concentrated temperature difference with the mean temperature of the intended space.

Heat Generator

Heat generator is the key member of HVAC system components when it comes to heating. What happens in these devices is the generation of heat, for instance, through extraction of fuel energy inside a furnace, aka combustion chamber. Hot flue gases will then provide heating for the air or another fluid such as water that will later heat the air entering the conditioned environment. Electric heat generation could also be used to heat the conditioning air.

Although there might be a variety of choices for heat generators, the most common forms are the furnaces, and therefore, it is important to consider combustion efficiency for resource control and pollutant emission for environmental concerns regarding these HVAC system

components.

Combustion efficiency is proper and complete reaction of fuel with oxygen inside the furnace so that no fuel is wasted. The efficiency of the furnace could also be extended to optimal transfer (minimal loss) of the generated heat to the next intended medium, be it the conditioning air or another fluid such as water. The general considerations regarding this would be proper mixing of fuel and air inside the furnace, well-shaped glow sticks or igniters, optimal heat transfer, and also operation safety.

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Heat Exchanger

Heat exchangers are one of HVAC system components that receive the heat generated in the heat generation unit and transfer it to another fluid. Some control unit will activate the furnace or electric heating elements when needed to regulate the air temperature passing through the heat exchanger.

In many applications, the heat is transferred directly to the cool air in order to provide heating for the intended space. In this case, some device blows the air through hot flue gas tubes or electric heating elements, transferring the energy to the air via heat absorption.

Since most heat generators burn fuel as the energy source, some safety considerations shall be in order. It is because combustion systems mostly operate with excess air to lower combustion temperature and hence produce lower NOx emissions. Therefore, carbon monoxide would be one of the products of the reaction. A safety issue for heat exchangers is therefore carbon dioxide leakage into the air passing through the flue gas tubes. CO is a colorless gas without any smell, which can cause headache, dizziness, nausea, and even death in high levels. Therefore, detectors should also be arranged to monitor such leakages.

Blower

The air is forced by one of the HVAC system components, called the blower, through the heat exchanger into the air ducting that would take the warm air to where it is intended. The blower is driven by an electric motor by a shaft. The flow of the air could adjusted by modifying the motor speed. Such motors should be of the variable speed type.

Variable speed motor blowers will reach higher speeds incrementally, and therefore lower the amount of noise when lower amounts of air is required. This gradual increase of speed would also decrease wear and tear of the rotating parts, as well as lowering the energy consumption of the unit; therefore, operation and maintenance costs would be lower for these kinds of blowers.

Condenser Coil or Compressor

One of the important HVAC system components is the compressor or condenser coil which is normally placed outside. The warm refrigerant gas is taken to the compressor to dissipate heat to the outside environment and turn into its liquid form. This liquid refrigerant is then taken to the evaporator coil through copper or aluminum tubes. A fan will increase the amount of air flown passed the coils and boost the condensation process.

Evaporator Coil

The evaporator coil is one of HVAC system components located indoors that receives the condensed refrigerant liquid from the compressor. The liquid refrigerant is atomized by spraying nozzles that increases the rate of refrigerant evaporation when it comes to contact with the room's warm air.

There are fans that make the room's warm air flow through the return ducts onto the evaporator. The warm air rejects heat to the atomized refrigerant and cool down, after which it is redistributed back to the rooms via the ducting. As the air passes over the cold evaporator coil, its moisture level would be lowered due to condensation of the moist air on the coil. The decrease of humidity makes the air feel even cooler, adding to the cooling process efficiency. The warm gas would then be re-transferred to the condenser coil to repeat the cycle.

Air Ducts and Vents

The air is transferred via ducts to reach different HVAC system components. Good ducting is essential to have high quality air delivered to the zone. Duct leakage could result in noise when the system is working. In addition, when the air ducting is not in good shape, odor and excess moisture could fill the air.

The air is delivered to the room passing through the vents. The vents could be equipped with air filters to block the dust and small particles from entering the room. Air filters could also be placed in other places inside the ducting.

Heat Pumps vs. Air Conditioners

What happens in heat pumps is the reverse process occurring in air-conditioning units, but with the same components as air-conditioners. Therefore, the heat from the outside would be transferred to the inside during the cold weather conditions.

Split Units

Just to clarify the usage of these HVAC system components for one of the widely used types of air-conditioning/heat pump systems, i.e. the split units, the condenser/compressor is placed outside.

More on HVAC System Components

You can learn some more details about HVAC system components here.

HVAC System Working Principle

In order to see an interesting video about the working principle of different HVAC systems such as chillers, rooftop units (RTU), and air handling units (AHU) click here.