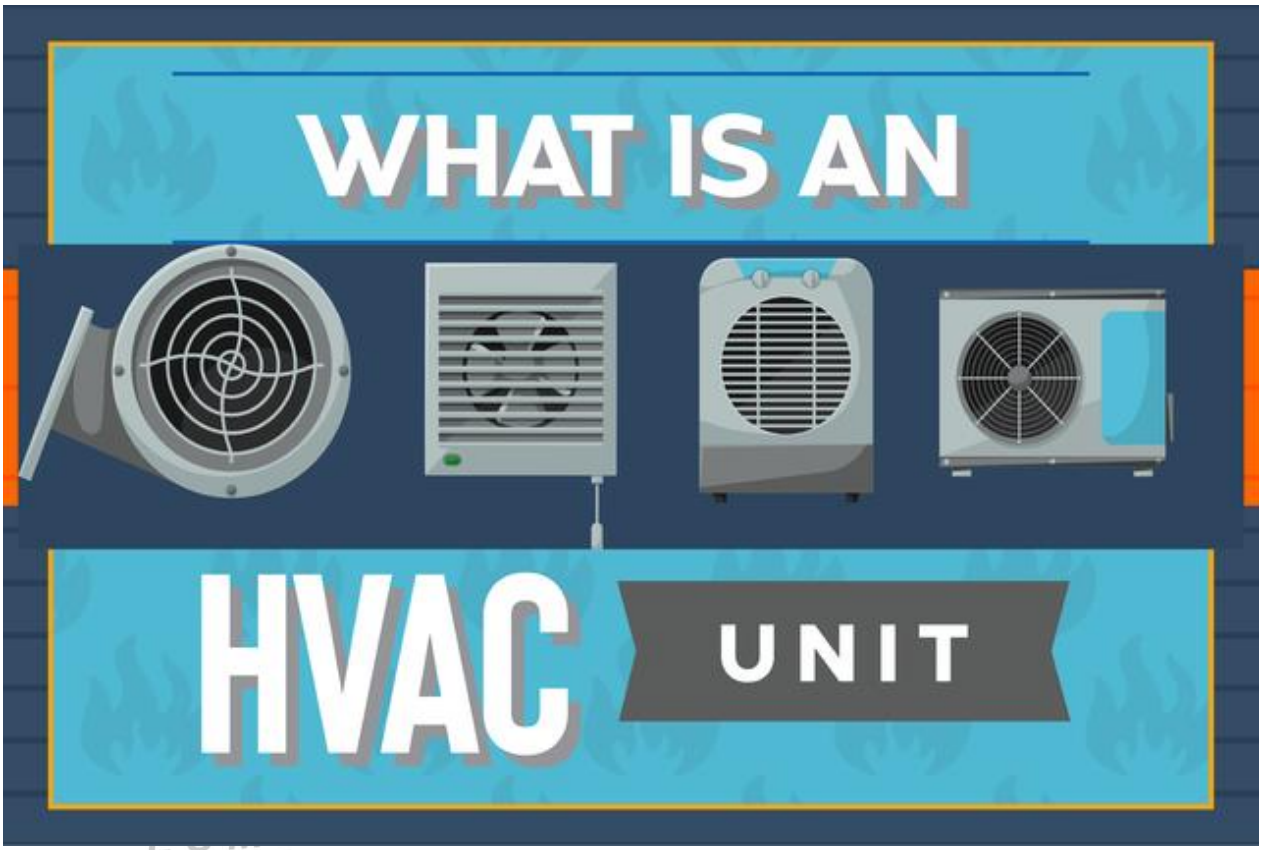

WHAT IS AN
HVAC
UNIT

PREFACE

HVAC systems and installation consume more energy than anything else in the house. That means that the majority of your monthly bills are the operational cost of AC and other supporting appliances. Unfortunately, this system is also prone to inefficiency. A little bit of improper installation or treatment would make you spend more money in the long run.

Many people do not even realize that they are spending too much money on this stuff. Meanwhile, if you are careful and considerate enough, there are many things you can do to cut down this household spending. Surprisingly, the optimal efficiency of HVAC systems can lower energy consumption by up to 30-50%.

It is crucial to remember that indoor air temperature and quality can get affected by plenty of factors. Moreover, the AC mechanism seems to be a little complicated for some people. Therefore, making your home HVAC system more efficient is not as easy as switching a button. There are many things you can try; from the first time you plan to build your house to the times when you find troubles with your AC appliances after many years of operation.

This book provides every single important thing to know about HVAC that could help you save energy and money as much as possible. The more tips you apply and the more factors you consider would result in the more efficient your house would be in consuming energy.

Contents

CHAPTER I - PREPARE YOUR HOUSE

Before relying on the expensive artificial system, it is highly advisable to optimize natural air control first. There are useful tricks you can try at home for this matter. If you are currently renovating or constructing your residence, try discussing the subject with your contractor or architect to see what else you can do better.

1.1. Home Design Tips for Natural Ventilation

Ventilation is the key to air circulation, which significantly affects indoor air quality and thermal comfort. Without natural ventilation, some HVAC systems might be necessary to get your indoor air cleaned and conditioned properly. It is an important measure to keep your house a comfortable and healthy place to live.

Locate Your Windows Strategically

Windows facing directly to the sun have a higher risk to get glare and overheat from the sunlight, especially if your residence is sitting in a tropical area. The most convenient window orientation is the south and north sides of the building. The same principle also applies to glass walls.

Window Types

Opt for adjustable windows so you can control airflow and sunlight as needed to acquire optimal air circulation and thermal comfort. Clerestory windows, openable skylight, and controllable window blades would be beneficial both for natural ventilation and home aesthetic. If your windows are at risk to receive excess light from the sun, you can consider adding some blinds, drapes, or light-blocking window screens.

Make Cross or Convective Ventilations

To allow the smoothest airflow, try positioning openings at the opposite sides of the room. But instead of placing them to face each other, try to shift them a little bit. This setting makes cross ventilation, which results in the most optimal airflow. Convective ventilation, also known as stack ventilation, can also serve the same purpose by placing the openings in different heights to increase the air buoyancy.

Choose the Right Materials

Some materials can retain heat more than others. For ground covering, soil and grass would help keep the air cooler than massive concrete. And as for the wall, the best materials would be wicker and bamboo. But if you need a more durable material, the common brick and mortar would be fine as well. And as for the roof, the light-colored one will absorb less heat than the dark one.

Semi Outdoor Spaces

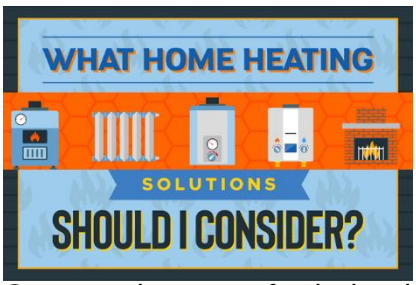
A transitional space between indoors and outdoors can encourage airflow and block excess heat from outside to come inside the house. It could either be a terrace, balcony, or a home atrium.

These spaces of the house can also be cozy places to relax. They would also increase the aesthetic value of your house.

Smart Landscaping

Plants can promote natural air cooling on the surrounding environment. Hence, having a lawn would help you a lot to get comfortable in your house. A professional landscaper can even analyze the heat and wind that goes to your house, so they know what kinds of plants to place and where.

1.2. Preparing Your House for Winter



Your heating system will work harder in winter than usual. Not only it may cause increased energy consumption, but it may also trigger problems to occur on your system.

To avoid problems, here are some tips you should try beforehand to prepare your house for winter.

Get your home perfectly insulated. Consult your HVAC contractor to choose which type of insulation is most suitable for your house.

Make sure you have your heating system properly installed and well-maintained.

Get a schedule for your heating system tune-up and insulation check. Both of them need to be in their best condition to perform optimally during the cold season.

Inspect your drainage system. Water needs to flow smoothly. There should not be any area where water may pool and freeze.

Change the batteries of your smoke and carbon detectors. Both devices should run properly to protect your family from danger.

Change your furnace filter to smoothen the airflow and improve indoor air quality.

1.3. Preparing Your House for Summer

Contrary to your heating system, your cooling system would perform its hardest during the summer. For the same efficiency and performance reasons, you need to get your house prepared well for the summer. Here are some useful tips for it:

Make sure you have your AC or any other cooling system properly installed and well-maintained.

Clean all the components from dust and dirt because they may block the performance and cause overheating.
Install some blinds or drapes on your windows and glass walls, especially those facing east and west directions.

Your AC filter should be new and clean at the beginning of the summer to allow a smooth airflow and cleaner air quality.

If you don't have a programmable thermostat, it might be the time to consider buying one. The tool allows you to control your AC more efficiently.

Take a look at the outdoor unit of your AC. Clear it out from debris, leaves, or shrubs, if any. Don't put anything in the radius of two feet from the unit.

CHAPTER II - UNDERSTANDING THE MANY TYPES OF HVAC SYSTEMS

Nowadays, people are getting more dependent on technology to control the HVAC of their houses. The trick indeed may be effective to get us comfortable with our indoor environment. With the development of technologies, we can see how there are many types of HVAC appliances in the market.

Since the HVAC system is crucial to a house's energy consumption, it is necessary to understand all the alternatives you have in the market. Each of them has features that may or may not be suitable for your house. By understanding this matter, it would be easier to decide which one you should purchase for your house.

2.1. Types of AC Systems

An air conditioner works by removing the heat from your indoor air and releasing it outdoors while blowing the chilled air back to your room. Although the basic concepts may be similar, there are

many types of AC systems in the market. They have different advantages and disadvantages that you need to think through to determine which one fits your residence the most.

Central AC System

Central AC, also known as the whole-house AC system, refers to a system that cools the indoor air in the whole house thoroughly. The technology has a central system that does the cooling process. It also has a network of ducts from and to every room of the house to suck up the warm air and blow out the cool air.

Pros:

- Delivering cool air evenly and thoroughly in every part of the room
- Longest lifespan that can last up to 15-20 years while other AC types can only last for 10-15 years
- Better aesthetic for your house because the units are visible
- May require less money for installation if your house already has a ductwork

Cons:

- More expensive on its initial cost if you haven't got ductwork installed
- Low efficiency because there is some energy loss when the air flows through the ductwork
- Unable to control different rooms separately

Split System

The split system or ductless AC consists of two units; the indoor and the outdoor. The indoor unit sucks up the warm air and blows cool air, while the outdoor unit releases the heat removed from the indoor air. Unlike the central system, split AC can only cool one room.

Pros:

- Best energy-efficient AC system
- Able to control each room differently
- Low noise when operating
- Widely available in various sizes

Cons:

- Would require multiple units of AC to get the whole house cooled off
- The indoor unit is visible in the middle of the room
- Shorter lifespan than the central system

Window AC

Being accurate to its name, window AC is the unit fitted on the window. The appliance will cool the indoor air on a specific room it is facing. There is only one boxy unit of this appliance. The size is moderately bigger than the split AC unit.

Pros:
- Affordable to buy
- Practically easy to install
- Easier to maintain and operate
- Highly energy-efficient

Cons:
- Unpleasant to look at because the huge box blocks the outdoor view
- You will lose the actual function of the window
- It is insecure to leave the unit hanging outside because it can get stolen, especially if the window is on the ground level

Portable AC

A portable AC is a single unit of air conditioning with wheels at the bottom. It can cool a single room and is movable to cool another room. The technology is simpler than the window unit.

Pros:
- No installation needed
- You can bring it as you move to the other room in the house
- Very cheap on both initial and operating cost
- Can be stored in a hidden place when not in use

Cons:
- Most units have low capacity, making them ineffective to cool a large room
- Energy inefficient because the warm air gets back to the room due to lack of access to release it outdoor

The most common types to use for households are either the central or split AC units. If the house needs cooling in every room evenly, the central AC would be the most suitable one. But if you only need the cooling on some specific rooms, then the split AC units might be better to buy.

2.2. Types of Heating System

While air conditioners focus only to cool the room, some houses may also need another system to help them in the winter. Similar to the cooling systems, heating systems also come in various

types with different pros and cons. Here are some technologies that you can consider to warm up your house:

Heat Pump

A heat pump is similar to a regular air conditioner where the unit strips heat out of the air and brings it to release somewhere else. However, the heat pump can work in reverse as well. It makes the unit able to cool off the house in the summer and warm up the house in the winter. Heat pump relies on electricity to generate heat to raise the indoor air temperature.

Pros:

- Lower operational cost than other heating systems
- Safer from the risk of fire hazard and carbon poisoning because there
- Higher energy efficiency than any other heating system
- Works for the cooling system as well, so you don't have to get an AC system

Cons:

- Takes effort and time to install
- The initial cost is pretty high
- Can be noisy during operation
- Effectivity will decrease on extreme cold because the system relies on the outdoor air

Furnace

A furnace is a system that could generate heat to warm up the air and distribute it to the whole house with blower fans through the ductwork. This technology runs either from gas, propane, or oil combustion. Some newer versions of furnaces use electricity as their sources of power.

Pros:

- Easier to install, maintain, and repair
- Generally cheaper than the heat pumps
- More reliable even on freezing weather
- Low installation cost
- Available in many variations in the market

Cons:

- The combustion types possess the risk of fire, explosion, and carbon poisoning
- The system is still generally inefficient, although the newer models are already more energy-efficient than the old ones.
- Cannot work double as a cooling system as well
- May cause the humidity level to drop especially during extreme cold temperature

Boiler

The boiler is the central system that generates heat from hot water to warm up the whole house. There are two types of boilers in the market; steam and hot water boilers. Both units will heat the water and generate either steam or hot water to distribute the heat through pipes and radiators.

Pros:

- Operates more quietly than other heating systems
- Heat the whole house more evenly
- Produces cleaner air as it doesn't blow out airborne particles
- High energy efficiency
- Lower operational and maintenance cost

Cons:

- Installation takes time and high cost due to its complexity
- There is a risk of water leaks, which may lead to mold issues
- Takes time to reach the expected level of warmth
- Still requires to install air conditioners to cool the air on summer

2.3. Types of Appliances for Improving Air Quality

HVAC is more than just heating and cooling. It can also include maintaining your indoor air quality (IAQ). According to the Environmental Protection Agency (EPA), a house with terrible circulation or IAQ control can be five times more polluted than the outdoor air of an industrial city. Unfortunately, poor air quality strongly links to many health problems, especially respiratory issues.

The definition of good-quality air means it has the right level of humidity and carries a low number of contaminants. Here are some appliances that could help to maintain the air quality of your house on a healthy and comfortable level:

Humidifier

Low-temperature weather usually causes the humidity to drop as well, especially if your house relies on a furnace as the heating system. In extreme conditions, the humidity level in your house may fall below 10%, which is much lower than the minimum recommended level of 30%. Moreover, most people feel most comfortable if the humidity level stays around 40-50%.

Dry air causes body moisture to evaporate more quickly. As a result, you might feel chilled more easily. You may also suffer from scratchy throat and mucous membranes in your nose. Your skin and lips are more likely to get dry, easily irritated, itching, or chapping.

Besides affecting your health and comfort, low humidity air may also harm your house, especially on the wooden materials. Your parquet floor will start warping. The gaps between each other may get wider. Wallpapers may also start peeling off in the corner. If you have a piano, it may also go out of tune.

A humidifier can effectively combat all of those problems. The system works by releasing water vapor or steam to the indoor air to increase the humidity level. If dry air is a constant issue in your house, you can consider installing a centralized system of a humidifier. But if the issues are occasional, the portable unit would be sufficient.

Dehumidifier

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) suggests keeping the humidity level no higher than 65%. The level of 60% is mostly the highest level that people can tolerate. Unfortunately, the air can get too humid when the weather gets hot.

While low humidity can be harmful, too high of humidity can also be a serious concern. Such a condition may cause low energy and a lethargic body. People with asthma may also find it more difficult to breathe. Moreover, many kinds of germs and molds could grow well in a high moisture environment.

Humid air may also create problems in your house. The most common issue would be mold growth and musty smell. There would also be some condensation stains on window frames, walls, and ceiling. Moreover, pests are also more likely to come invading your house.

A dehumidifier appliance will suck the humid air and strip the excess moisture from it before releasing the air back to your room. Most AC units already can perform such a task. But if you feel your indoor air is still too moist even with the AC running, then it means you need to invest in a dehumidifier.

Air Purifier

Also known as air cleaners, air purifiers work by reducing the number of pollutants in the air to deliver cleaner air. Not every house needs this kind of appliance. Sometimes, natural ventilation and regular AC are enough to keep the indoor air clean.

Here are some conditions that may require you to have an air purifier in the house:

- You or one of your family members has an allergy or respiratory issue
- There are one or more pets in the house
- The environment you live in has massive pollution
- Your house has terrible air circulation

There are more productions of contaminants in the house such as if someone is smoking or if you cook more often without a proper exhaust system in the kitchen

There are many types of air purifiers available in the market. They have different technologies to neutralize different types of air contaminants. If you think you need an air purifier, it is important to pick the right type to settle down your concerns effectively.

Here are the types of technologies in air purifiers:

Filter

Air purifiers with filter layers are designed to block airborne particles such as dust, pet dander, and some types of germs.

Most AC units already have filters with low to medium quality. If these are not enough for your indoor air, you can consider having an air purifier with HEPA (High-Efficiency Particulate Air) filter. It is the most effective type of filter that could capture airborne particles as small as 2.5 microns.

UV Germicidal Lamp

If your concerns are mostly about viruses, bacteria, or mold, the air purifier with UV light is what you need to get. The spectrum of UV-C light can break down the cells and turn those pathogens inactive. An air purifier with a UV lamp would only be effective if it has the right level of intensity. Hence, get the power correctly. Moreover, be sure to avoid getting the light exposed directly to your skin or eyes because it may irritate.

Ionizer or Electrostatic

Air purifiers with an ionizer or electrostatic technologies are usually effective to neutralize gaseous contaminants such as fumes and odors. The system works by generating charges that could capture particles such as microbes, mold spores, and allergens. Unfortunately, this type of air purifier produces ozone. Not only it may harm the earth, but it also may cause discomfort for people with respiratory sensitivities.

Hybrid

Consider buying a hybrid air purifier if you have several contaminants to concern about. The term refers to an appliance that combines two or more technologies to allow them to combat more types of contaminants in the air. Manufacturers nowadays produce more hybrid air purifiers than single-technology ones.

2.4. How to Choose the Right Unit to Buy

By understanding each type of technology, it should have been easier for you to choose which types of appliances you will buy for your home HVAC systems. The next challenge would be how to choose the right unit to buy. Here are the tips you can try:

Trust the Brand Reputation

Appliances from reputable brands usually have outstanding performance and durability. Not to mention helpful customer service that you can contact and rely on anytime you need assistance. By buying from the right brand, you will less likely to experience problems with the products.

Energy Star Label

The blue label of Energy Star is the one you should look for in HVAC appliances. Energy Star is a federal program by the Environmental Protection Agency (EPA) to make it easier for the citizens to buy the appliances that are energy efficient. The rating itself indicates how the specific unit has met the national standardization of energy efficiency.

SEER or EER Ratings

Both SEER and EER ratings show how efficient the appliance is in conserving energy. The higher the number means the more efficient the unit is. SEER stands for Seasonal Energy Efficiency Ratio, while EER stands for Energy Efficiency Ratio. If you live in an area where the weather can fluctuate significantly, it is the SEER rating that you need to pay attention to. But if your area has a more stable climate, the EER rating would be more important to consider.

Get the Correct Size

Size is crucial in almost any HVAC appliance. Undersized units may not deliver sufficient results, such as the AC is not cool enough or the air purifier is not clean enough. On the contrary, oversized ones will be a waste of energy. Moreover, both cases of improper sizing may shorten the lifespan of the appliances.

Compare the Price and Specification

Price does matter to consider, especially if your budget is tight. Thus, try browsing as many models as possible and take a few as candidates. Compare the specification as well as all the advantages and disadvantages. The more you know and consider, the more you will be sure which one to pick.

Warranty

Appliances from reputable brands usually come with a reliable warranty. Yet still, it is necessary to check the terms and conditions, as well as the procedure to make the claim. Make sure you

know where to go when something happens with your unit. Top-notch brands usually will even provide a substitute unit while your appliance is under service.

CHAPTER III - INSTALLATION

HVAC systems are not like IKEA furniture that anybody can execute only by reading the manual instruction. How do you get the systems installed would highly affect the performance of the units.

3.1. Is It Possible to DIY the HVAC Installation?

Most types of HVAC systems are too complex to install by the homeowners without specific skills. Boilers, furnaces, and central AC for example are too intricate and technical. A single mistake may lead to serious consequences such as:

- Terrible performance of the appliance that it may fail to deliver the results as expected.
- Lower energy efficiency, which will make cost you more on your monthly bill.
- The system may malfunction and causes many possible issues, such as leaks and unwanted noise.
- On some types of appliances, improper installation will increase the risk of hazards such as toxic gas, explosion, and fire.
- Shorter lifespan of the appliance due to extra stress the system has to endure from poor performance.

Some appliances with simpler technologies are possible for DIY installation such as window AC and portable humidifier. But even those will require you to have enough knowledge and skill about HVAC installation. Otherwise, it is better to trust a professional.

HVAC systems with complex technologies such as central AC and boilers are impossible to install without a professional contractor. You need a legal permit to get the project executed, which is hard to acquire if you have no proper certification to perform.

3.2. Choosing the Right HVAC Contractor

It is highly advisable to leave the matter in the hands of the professional. Even so, you need to make sure to hire the right contractor to get the most of your service. It is more than just getting

your system installed properly. You will need their service again later either for regular maintenance or some repair service.

Here are how you should choose an HVAC contractor to trust:

Browse for Qualification

Find as much information as possible about the HVAC contractors available in your area. You can either browse it on the internet or simply by asking your friends or family about it. List several names of the contractors and collect information regarding their qualifications.

Certification

Never hire an uncertified company for your home HVAC systems. Certification proves the contractor's skill and knowledge in what they do. It also gives you a secure legal standing to avoid unwanted disputes in the future.

Insurance

Insurance is important to anticipate accidents during work so you don't have to worry about unexpected spending. Moreover, an insured company shows that they care about their workers. It also means that the company has a specific safety standard and procedure.

Availability

Sometimes, you would need your HVAC contractor to come right away due to sudden problems with your appliance. If your contractor is too far or too busy, you might need to wait for too long to get their service. A reliable contractor should be ready on call almost anytime.

Warranty

Professional contractors always provide a warranty for their service to prove the quality of their service. On the contrary, irresponsible companies will leave you with poor-quality work that would be problematic again soon.

Reviews and Recommendation

The last things you should check on the contractor candidates are their reviews. Try finding actual reviews from people whoever hired them. You can browse the internet for it or simply ask people around you.

Home Inspection

A professional HVAC contractor will never offer a specific service without inspecting your house first. Either it is an installation, maintenance, or repair, the service can vary in different situations. The technician should visit your house first and check the situation. They will later tell you what they plan to do to settle your HVAC needs.

Quote

Expect a formal quotation from your prospective contractor. It should contain any important information such as tariff, job description, payment procedure, expected duration, and many other more. Your contract would also be in a signed agreement in legal paperwork.

CHAPTER IV - MAINTENANCE AND OPERATION

4.1. Understanding How AC Works

Understanding how your AC works can build your senses in treating your appliance. When something breaks, you would be more likely to know what might be the causes.

Whatever the type is, the basic technologies of air conditioners are all the same. Instead of generating coldness to send into the room, the cooling process happens to be a mechanism of removing heat from the indoor air itself. These are the vital elements that work simultaneously in this system.

Air Handler

When the system turns on, the blower fan inside the air handler will suck the indoor air and send it to the evaporator. Later on, after the air has been cooled, the air handler will blow it back to the room.

Refrigerant

The refrigerant in the evaporator is the liquid that will absorb the excess heat from the air to reach the expected temperature. This chemical is contained in one closed-loop pipe that goes from the evaporator to the condenser. When carrying heat, the liquid will turn into gas. It will turn liquid again after releasing the heat out.

Evaporator

The evaporator is the component where the refrigerant will absorb the heat. After transferring the heat, the refrigerant will go back to the evaporator. There is an evaporator valve that controls the amount of refrigerant to go back to this part of the system.

Compressor

The compressor is the one responsible to circulate the refrigerant. This component has a motor with a cylinder and a piston. It would push the gas refrigerant to move from the evaporator to the condenser. The compressor is the most vital part of an air conditioner. If it is severely damaged, you might need to replace the whole unit as well.

Condenser

The condenser will release the heat carried by the refrigerant to the open-air outdoors, which effectively turns the refrigerant vapor back on its liquid state. On top of the unit, there is a cooling fan that could make the process more efficient. Condenser usually has a grill covering on top of the fan to avoid debris from falling on the machine and causing malfunction.

Thermostat

A thermostat is not a part of the air conditioning main system. But due to its vital contribution to thermal comfort and energy efficiency, almost every household would install one to complement their HVAC system. A thermostat allows you to set both your cooling and heating more specifically. The system has a sensor that detects the temperature.

The thermostat will start working when it notices a difference between the desired temperature on the setting and the actual temperature outside. It will trigger either your cooler or heater machine to work accordingly to acquire the level of thermal comfort.

In the portable and window AC units, all of those components are present in a single unit of the appliance. In both split and central AC systems, the indoor unit contains the air handler and the evaporator while the outdoor unit has a compressor and a condenser in it. Central AC also has ductwork, which is a network of ducts to distribute the air. Supply register and duct are responsible to deliver chilled air to the rooms, while the return registers and ducts will suck the warm air from indoors to get conditioned by the system.

4.2. HVAC Regular Maintenance Checklist

Many people underestimate the importance of regular maintenance and prefer to get a service only when something goes wrong. Little did they know that it only makes them spend more money than investing in a proper tune-up routine.

This kind of service can maintain the optimal performance of your appliance. As a result, your system will stay energy-efficient and deliver air at a higher level of quality for your family. Maintenance can also detect problems early to avoid the issues growing and cause terrible damage. With regular maintenance, your air conditioning system may last longer as well.

HVAC regular maintenance is something you can DIY if you have enough skill and knowledge.

But of course, most HVAC technicians can deal with it for you. On each checkup session, make sure your appliance gets these jobs done:

- Replace air filters with a new and clean one to smoothen airflow
- Clean both the condenser and the evaporator coils to allow smooth airflow and prevent overheating on your AC system.
- Unclog the drain lines and clean it up to promote the flows more properly
- Remove the standing water on the drain pan and make effort to prevent over
- For the central AC, inspect the ductwork to see if there are any mold, dirt, or even pests in it
- Check the refrigerant level and see if there is any leak on it
- Inspect the cables and the electronic system, including the fuse box or the MCB panel
- Inspect the whole components to make sure they are still on their prime condition
- Tighten any loose parts and replace ones that can't be steady on their positions
- Lubricate all the moving parts to make your AC unit runs more smoothly
- Clear debris and dirt on the outdoor unit
- Repair any problematic parts if possible
- Replace any worn out parts and damaged parts that are impossible to fix
- Check the humidity level and get a humidifier or dehumidifier if the moisture level of your indoor air is concerning
- Check the electrical charge to anticipate the risk of a short circuit.
- Check the airflow and have a total inspection if you notice it is not as smooth as it should be
- Replace the battery of your thermostat

Experts recommend getting your AC checked up once in every six months. The best time for those is about two weeks before the summer starts and the six months sharp after the last checkup.

4.3. Save Energy When Operating Your HVAC Systems

Proper installation and maintenance are vital to let your HVAC most optimally. However, there are extra efforts you can do to save even more money from your monthly energy bill. Most of the tips are easy but effective, making them worth trying. These are the basic tips you should remember when operating either your cooling or heating systems.

Replace the Old Units

Appliances will lose their efficiency as they age, including any HVAC systems. Moreover, old models of appliances are not even energy-efficient, to begin with. Pay attention to the expected lifespan of your appliances. Consider replacing them with newer technologies if they have been too old or are losing their best performance.

Invest in a Programmable Thermostat

A modern one has the feature to program both cooling and heating systems more specifically, allowing you to reach the optimal performance of your HVAC units. The digital programmable thermostat might be a little bit more expensive than the conventional one, but it will save you a lot more money in the long run.

Close Damper When Not in Use

Your fireplace might be nice to use in the winter but make sure to close it when you are not currently using the device. The damper of your fireplace could suck up all the cooled or warmed indoor air like a giant vacuum cleaner. It is important to keep the flue closed when your HVAC systems are operating.

Always Get Original Replacement

If your appliances break and need a part replacement, make sure your HVAC contractor uses only the original and legal parts. Using fake products may lead to inefficiency, terrible performance, or even shorter lifespan of your units.

Set Your Thermostat Down

A programmable thermostat is useful in winter as much it is in the summer. When nobody is in the house, you can set your thermostat lower than usual in the winter and set it up higher than usual in the summer. When you get back home, you can readjust it back to your comfort level without causing a spike in energy consumption. The trick is also applicable at night because you will be less sensitive to thermal comfort while you are sleeping.

Utilize A Ceiling Fan

A ceiling fan consumes low energy, yet it is highly effective to circulate the air within a room. It helps to distribute the air from your HVAC system more evenly throughout the entire room, either

cooled or warmed. With less work to do, your HVAC systems can cut off its energy consumption as well.

Avoid Frequent Changes

Some people like turning their AC on at a very low temperature to chill the room more quickly and then adjust the temperature up again after a few minutes. Although it can be effective, this trick wastes energy. Changing the desired temperature while your AC is currently running has the same mechanism of turning your AC on. It needs a spike of energy consumption to power the process.

Adjust Your Curtain

During winter, opening up your curtain on sunny afternoons can effectively warm the house up to 25%. On the contrary, you should keep the curtain completely shut at night to block the coldness from outside as well as to avoid the warmed air indoor seeping out. Meanwhile, in the summer, closing up the curtain can prevent excess sunlight to heat your home interiors.

Position Furniture Strategically

Check all the registers, vents, and anything where the air flows through. Furniture, curtains, rugs, or anything should not be blocking the way. The blockage could affect the distribution of the conditioned air, which reduces the effectiveness and efficiency of the HVAC system.

Wear Appropriate Clothes

Wearing sweaters and socks at home contributes a lot to keep you warm in winter. With such a trick, you can turn your thermostat a little bit lower. Choose organic or breathable materials for your clothes so you can still feel comfortable wearing them all day long. On the contrary, try to dress up lightly during summer to balance the hot weather.

4.4. Maintaining Your Indoor Air Naturally

Besides operating your cooling and heating systems more efficiently, it will also help a lot to maintain smooth air circulation and cleanliness. These efforts can increase your indoor air quality and keep it on a healthy level.

Open the Window

Get your natural air circulation by opening up the windows when the weather is nice. It doesn't have to stay open for hours. A few minutes would be enough to let go of the stuffy indoor air out of the house so the clean fresh air from outside can come inside your house.

Keep the House Clean

Dust and bacteria can get flown by air and be its contaminant. By keeping your house clean, there will be fewer possible contaminants in the house to put your health at risk. Cleaning a house would also include cleaning your bedding and other soft surfaces as well as removing trash in the house.

Watch Your Cooking Smoke

The combustion while cooking also contributes to decreasing your indoor air quality. Your kitchen should have proper ventilation, or at least an effective cooking hood above the stoves. It would also help if you choose a cooking oil with a high smoke point.

Take Care of Your Pets

Pet dander (shed dead skin cells) are one of the most common types of indoor air contaminants that trigger allergic reactions. Groom the little buddies regularly to prevent their skin cells and furs from polluting your indoor air. Don’t forget to always clean up after them.

Take Off Your Shoes

Take off the shoes you wore outdoors when you enter the house. The dirt on your shoe soles may get blown and fly in the air as airborne particles. If you need footwear to keep your feet warm in the house, use a pair of house slippers instead.

Use Non-Toxic Chemicals

The cleaning agents you use may also contribute to contaminating your indoor air. Some harsh chemicals could irritate eyes, noses, skins, and even your internal organs. If possible, opt for the more eco-friendly solutions.

CHAPTER IV - TROUBLESHOOTING

If you keep its regular maintenance, troubles would be less often to occur. Even so, it is still normally possible to have some problems with your HVAC system. What matters is what you do to settle the issues.

Sometimes, DIY tricks may fix them. But some other times, it is better to leave the matter in the hands of professionals to avoid worsening the situation. So here is a list of what problems that are common to occur, the cause, and the HVAC troubleshooting tips in many kinds of situations.

5.1. AC Common Problems

Summer is the worst time to have a problem with your AC. So, here are what you need to anticipate and understand:

- AC Does Not Deliver Cool Air
- There are many possible reasons for this classic issue. Sometimes, a small DIY trick can fix it. But in the worst-case scenario, you might need to replace the entire unit. Here are some possible fixes for when your AC fails to blow out cool air:
- Check the electrical connection to see if something is disconnected.
- Reset your thermostat to clear out the possible errors.
- Replace your dirty air filter with a new one to allow airflow.
- Clean both the evaporator and condenser coils to prevent restriction with the airflow.
- There might be a refrigerant leak. Call your HVAC handyman if you find such a case.
- If your appliance is fine but too old, then it must have deteriorated. Consider buying a new model.

Ask for a total inspection by a professional technician to see if any faulty parts or damaged ductwork. You might need some repair or replacement service.

Frozen AC Coils

Frozen AC coils are common to find, but you should not ignore it. If left untreated, the minor issue can develop to be bigger problems. Here are what you can try to do:

- Turn off your AC and let the ice melt naturally.
- Clean the evaporator coils
- Unclog the drain pipe
- Clear out the water on drain pan and make sure it is still working properly
- Reset your thermostat by avoiding drastic difference between indoor and outdoor temperatures
- Ask your HVAC technician to see if there is a technical problem, such as a refrigerant leak, faulty blower, damaged ductwork, or blocked vents

Water Leaking from the System

Besides removing the heat of the indoor air, an air conditioning system also strips the excess moisture to avoid dampness. This process results in a few drops of water as by-products. A drain

pan will contain these water drops and dispose of them properly through a drain pipe. There must be something wrong if you find water dropping out of the machine. Here are what you can do:

Check the drain pan and drain lines to see if there is any damage. Clean them all to unclog the flow. Replace the parts if necessary.
The air filter might be dirty. Replace it with a new one to solve the issue.

Get your trusted technician to inspect the whole system. There is a chance that the problem occurs due to improper installation.

Strange Noises from Your AC Unit

Another common AC problem is noise. When running properly, your appliance should be quiet or producing just a slow humming sound. So, if you hear something else, there might be something you need to do, such as:

Banging or Clanking Noise

This kind of sound probably comes from loose parts. Try inspecting your AC unit and tighten all the moving parts. You might also need to lubricate them to avoid clanking with each other.

Whistling Noise

A whistling noise is most likely due to a refrigerant leak. There is no DIY fix for this. You need to contact a professional technician to fix the issue.

Buzzing Noise

The noticeable buzzing sound might indicate there is an electrical problem or piping refrigerant. Get this issue inspected as soon as possible to prevent a more serious problem.

Clicking Noise

The sound of clicks usually occurs due to improper wiring or bad circuit position. Try checking out the electrical connection to fix the issue.

Rattling Noise

If your AC unit is already old, the rattling noise might be a sign that your appliance is starting to deteriorate. Consider buying a brand new unit to replace it. However, the noise might also come from loose parts.

5.2. Heating System Common Problems

Either you are using a furnace, a heat pump, or a boiler, the heating system in your house can have problems as well. Here are the most common issues to appear and how to get things done.

Disturbing Smell in Rooms

When you sense a disturbing noise in your house while you turn your heater on, then something wrong must have happened. If you are using a gas or propane furnace, there might be some chemical leaking. It could be dangerous. You must immediately turn the system off, open up the window, and call an HVAC contractor.

If the odor is more like a burning smell, then your heater might be smoking. Turn the system off immediately and inspect the problem. Most likely it is just the filters that need replacing.

Room Temperature Is Not Warm Enough

Many possible reasons may cause this discomforting problem. But most likely, one of these solutions can help:

- If your heater unit is very old, you might need a total replacement
- Your home might be completely insulated. Try inspecting the whole property or ask a professional to do so.
- Your thermostat might not work as expected. Try checking the setting and reset it. Changing the battery might also help to fix the issue.
- Replacing the dirty filters with a new clean one would affect the performance of the system significantly.
- Check your ductwork for possible leaks or damages

Call an HVAC contractor if none of those tips work so you could get a total inspection. Most likely there is faulty or damaged machinery.

Unexplainable Spike on Energy Bill

It is normal to have a higher energy bill in the winter than other seasons. But if the spike doesn't make sense, you better do something about it. Here are what can fix the issues:

- Replacing your outdated unit with an energy-efficient one.
- Replace the air filter and clean the whole unit to get the performance optimal again.
- Recheck your home insulation for any leaks

Get a professional to see if there is any motor damage or tripped breaker, which is possibly causing the bill spike.

CONCLUSION

It may take effort and even money to make your HVAC systems run most efficiently. But considering how much energy and money you can save from those; everything would be worth a try.

It is also important to remember that saving energy is more than just spending less money on your monthly bill. If your electricity still comes from fossil fuels, consuming less energy means burning fewer fossils. That could reduce pollution and the effect of the climate crisis on our planet.

If you think that keeping your HVAC efficiency is too difficult or takes too much time, get professional technicians to get the tasks done. Don't be careless and ignorant about your HVAC system, because you will regret it in time.