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Air Conditioning System Impact on Environment: A Review Paper

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ABSTRACT: ***Air conditioning is needed over time as the rise in temperature increases the heat of the surrounding so to maintain the temperature of surrounding air, an air conditioning system is used. A cool and cold atmosphere is now becoming the need of cities due to rising temperatures. Thus the focus of the study is on the impact of air conditioning on the environment and the different aspects that should be known before installing air conditioning systems. There are various studies and research done by different experts on the impact of air conditioning on the environment. It is observed that Heat Ventilation and Air Conditioning (HVAC) systems are important in urban areas which leads to a rise in greenhouse gases. The emission of greenhouse gases increases the temperature which increases the effect of global warming which affects the ozone layer around the surrounding. Thus it is necessary to decrease the use of AC but it becomes difficult to stay in a hot atmosphere. So further study is helpful to find alternatives to reduce the emission of greenhouse gases to reduce the pollution in the environment to obtain natural ventilation from plants.***

KEYWORDS: ***Air Conditioning, Greenhouse Gas, HVAC, Refrigerant, Ventilation,***

1. INTRODUCTION

A ventilation system lowers the room temperature by withdrawing humidity from the surrounding environment. They work primarily by pulling warm air further into circuitry and releasing the air temperature; however, there is much more to this process. During the residential air system operation, the evaporation of some other fluid, designated as that of the refrigerant, helps to cool. The air conditioner quickly converts gas into fluids and again uses chemicals, eliminating the warm air from the home. It is then thrown outside. An air conditioning system, in simpler terms, manages the heat, humidity, and quality of air in confined places. [1]–[4]. While the basic concept of air-cooling dates back to antiquity in Egypt, the first demand for air machines was constructed in 1902 by Willis Carrier in response to an air quality problem at a New York publishing firm. The technique not only maintains a location's temperatures but also its humidity, by cooling the air and passing it all through cold coils, allowing them to adjust the moist content of the atmosphere. Soon after, cooling systems were used in autos to improve domestic comfort. Air conditioner sales have expanded considerably over the years as a consequence of customer demand [5]–[7].

Manual air conditioning allows you to switch the unit on or off at any time. There is no waiting for air conditioning to start because it is not regulated by a thermostat. So, need an automated air conditioning system if the user wants the air conditioner to just be automated with little input from customers. This ensures that any device would turn on when users configure it, eliminating the need to review the controls every day [8]–[10]. There are a variety of numerous forms of air conditioning systems, and the one you select will be largely dependent on your requirements. For example, the size of the area, the amount of heat generated in that region, and the sort of controls required. Having the proper kind for particular needs is critical for

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controlling overall energy usage and maintaining your area at a comfortable temperature. Here are the most common types:

1.1. Split System Air Conditioning:

An outdoor and an interior unit comprise the system is commonly an air conditioner. The compressed air, cooling unit, and expansion coil are housed in the outside unit, which is mounted on or near the outer wall of the area to be cooled. The conditioning coil as well as an air filter are housed in the interior unit, which is mounted on the wall. Both units are linked by cables and tubes. Split systems are a wonderful alternative for households since the compressors and fan are placed in the outside container and enable several inside units to be linked to one outdoor box.

1.2. Package Air Conditioning:

Unlike typical air conditioning systems, which have two pieces: an external condensing and an internal air handler, packaged air conditioner units have all of the equipment encased in a single box, which is commonly situated on a building's outer wall or roof. Package air conditioning units provide a greater capacity for cooling or heating, making them excellent for usage in bigger homes or commercial buildings. They operate by installing a single component and linking it to ducts installed across multiple rooms. The machine cycles the gas through coils using energy as its source of power. Warm air is then drawn in by a fan and cooled by passing it over a cold evaporator coil. The cold air is then delivered into the building via ducts.

1.3. Central Air Conditioning Systems:

Central air conditioning is typically used to cool big residences or buildings, such as gyms or offices. Because they are rapid and effective at cooling bigger areas, insides are the most prevalent form of air conditioning system. The system is powered by an external cooling compressor. A coil loaded with refrigerant, similar to conventional air conditioners, is used to chill the air, which is then pushed out by a fan and distributed throughout the building via ducts mounted on the walls or floors. When there is heated air inside a room, the ductwork will detect it and convey the airflow to the air conditioning unit to be pushed outward. These window air conditioners are used to cool a particular extra space and are mounted at a window. They're great for households where individuals only live in one space at a time. A Windows air conditioner system is a self-contained appliance with all of its components enclosed within a single box. The window air conditioning system is inexpensive to buy and operate, and it is also quite small. These devices, which are put along the bottom half of the window, draw hot room air and send it in the front while forcing cooler air into the area to cool it down.

This little air conditioner performs exactly as stated on the package. It is a movable unit that does not need to be permanently installed. They're simple to install and function by extracting the warm air in any room via a little exhaust. This device may be transported from one room to another wherever the greatest attention is required. Air conditioning, commonly known as A/C or AC, is the act of eliminating heat from such an enclosed room to create a more comfortable internal climate (also known as 'comfort cooling') and, in certain situations, rigorously managing the moisture of internal air. Air conditioning can be accomplished by the use of a mechanical 'air conditioner,' or through several different means such as evaporative design and ventilated cooling. Air conditioning is part of a systems and method family that includes heating, ventilation, and air conditioning (HVAC). Heating systems are similar to air conditioners in many respects, but they employ a reversal valve that enables them both to cool and heat an enclosed environment.

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Air conditioners, which primarily employ vapor-compression refrigeration, come in a variety of sizes, from small units used in vehicles or single rooms to gigantic systems capable of cooling whole buildings. Heat pumps, which may be used for both heating and cooling, are becoming more widespread in colder locations. As per the International Energy Agency, 1.6 billion HVAC systems had been deployed in 2018, accounting for roughly 20 percentage points of global electricity demand in residences, and this figure is expected to climb to 6 billion by 2050. The United Nations has advocated for more environmentally friendly climate change mitigation methods such as absorbent design, condensing, selective shading, windcatchers, as well as greater thermal insulation. CFC and HCFC coolants, used during air conditioners, have destroyed the ozone molecules, while HFC coolants, such as R-410a and R-404a, intended to replace CFCs and HCFCs, are exacerbating climate change. Both issues arise as a result of refrigerant seeping into the environment, which might happen during maintenance. HFO coolants, which are used in most, if not most, current equipment, address both issues by possessing zero ozone risk perceptions and a far lower greenhouse effect in the single or even double digits as opposed to 3 or 4 digits for HFCs.

2. DISCUSSION

In normal AC systems, the vapor-compression procedure, consisting uses forced circulation and phase change of a coolant between liquids or gases to thermal transfer, is employed to cool. The evaporation phase can occur within a single integrated or plastic-wrapped piece of machinery, or even in a compressor that is additionally connected to the end ventilation system on the exchanger's side and warmth removal appliances on the condensing edge. A heat pump contains most of the same elements as an air conditioner, but it also features a reversal valve that enables it to heat or cool the area. Ventilation systems will reduce the percentage humidity level treated by the system if the interface of an evaporator section is much cooler than the moisture content of the surrounding air. An air conditioner designed for a populated environment will typically achieve a humidity level of 30-60%. Most modern air conditioners incorporate a moisture management cycle wherein the compressors run whereas the blower slows down to reduce evaporating temperatures and therefore condense more water.

The air conditioning system is a device that is employed to cool a place by extracting heat from the room and directing it to an outside location. The cold air is then circulated throughout the building via ventilation. Air conditioning units need some labor to operate; else, entropy will naturally decrease, which is prohibited by the Second Law of Thermodynamics. Air conditioners function similarly to heat pumps, however, they use a cooling cycle. The following methods are used to chill a chemical known as a coolant.

1. In the evaporator, a cold cooling fluid absorbs the heat from the hotter area, cooling it down; the coolant then changes phases to a gas and is sent via a compressor to raise its temperature.
2. The refrigerant then travels through into the cooling coil, transmitting the refrigerant's heat to the surrounding air.
3. The refrigerant then travels through into the cooling coil, transmitting the refrigerant's temperature to the ambient air.

The air conditioning unit is an important part of the HVAC system that concentrates on house temperature regulation to enhance comfort and livability. A dehumidifier uses the same refrigeration technology as a refrigerator, but combines the converter and the capacitance into one air path; the air first flows over the evaporator, which is chilled and humidifying, before flowing off the condenser coil, which is warmed before being returned towards the room. When the exterior air is colder than the internal air, free cooling can be utilized, eliminating the

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requirement for the compressor and resulting in increased cooling efficiencies. This might be used with seasonal storage of thermal energy as well.

Many air conditioners may invert the refrigeration unit and function as an external heat pump, providing warmth instead of cooling in an enclosed setting. In the industry, they are also referred to as "reverse cycling air conditioners." A heat pump is far more energy-efficient than electric resistance heating since it delivers heat from the breeze or subsurface to the heated space as well as heat utilizing purchased electric power. When the heat pump is activated and produces heat, the inner evaporator coil switches roles and becomes the condenser coil. The outdoor condensing unit also functions as an evaporative and produces cold air. Previous versions of forced air pumps became less efficient in temperatures below 4°C or 40°F, due in part to ice developing on the outside agency's heat transfer coils, which hinders airflow over the coil. To counterbalance, the thermal system must quickly convert back to normal air conditioning mode to reconnect the outside evaporator to the condenser coil, enabling it to heat and frost. As a result, certain heat hydraulic systems would include electrical resistance warming inside that flue pipe that is only activated in this mode to compensate for the transitory inside coolant that would be uncomfortable in the winter. Newer versions have enhanced cold-weather efficiency, with efficient energy capability as low as 14 degrees Fahrenheit (26 degrees Celsius). However, even in models with increased cold-weather performance, there is always the possibility that the moisture that condenses on the outside unit's heat exchanger would freeze, necessitating a defrosting cycle.

Because many countries refused to adopt the Kigali Amendments to limit hydrofluorocarbon usage and manufacturing, refrigerants caused and continue to cause serious environmental problems such as air emissions and global warming. Air conditioning now represents for 20percent of the overall global electricity usage, and the expected rise in air conditioner usage due to climate change and technological adoption will result in significant increases in energy demand. Solutions to ongoing air conditioners include passive cooling, passive solar cooling, and air circulation, manipulating blinds to reduce solar gain, and using trees, architectural shade, and windows to reduce solar gain. In hot weather, an air conditioning system can assist prevent heat stroke, dehydration from dehydration, and other series of repeated problems. Extreme heat is the most lethal type of weather phenomenon in developed countries. Air conditioning can be used to create a spotless, protected, hypoallergenic environment in hospital operating rooms and other settings where a hygienic, safe, allergic climate is critical to clinical outcomes and well-being. People who suffer from allergies, particularly mold allergies, may find it handy around the house.

3. CONCLUSION

Air conditioning units are a necessity in today's world, and they offer several benefits. However, there are several disadvantages to using an air conditioner. Air conditioning units consume a great deal of energy, in addition, to cause’s environmental harm but also raising our energy bills. Because of the growing energy demand, more fossil fuels are burned, resulting in a rise in Carbon dioxide emission that is hazardous to the environment. Air conditioning equipment produces a lot of evaporation, which can lead to excessive humidity levels. When humidity levels are too high, mold grows, which can trigger allergies in people with respiratory disorders. Humidity additionally draws bugs and it may cause diseases such as mosquito-borne infections, exacerbating the issue for those who live close to or in humid locations. Hydrofluorocarbons, which are responsible for the greenhouse effect that contributes to climate

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change and global warming are also found in air conditioners. The primary sources of effect for hydrofluorocarbons are industrial facilities, domestic air conditioners, and power stations.

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