



# SNS COLLEGE OF TECHNOLOGY

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## Department of Mechanical Engineering Window Airconditioner

### AIR CONDITIONING:

Air conditioning is the process of simultaneously controlling the temperature, humidity, air circulation and cleanliness of air within an enclosed space.

Control of temperature means heating or cooling the air in winter or summer respectively.

Controlling of air circulation involves the distribution of conditioned air evenly and pleasantly throughout the space at all times.

Control of cleanliness involves removal of dust, dirt, soot and any foreign matter by filtering the air that enters the AC plant. It also ozonizes or ionizes the conditioned air for elimination of unpleasant smell.

### USE OF AIR CONDITIONING:

\*\*\* Human comfort

\*\*\* Efficient functioning of the equipment such as computers, machine tools, Precision instruments, electronic components, telecommunications etc

\*\*\* Maintains uniform temperature and humidity.

\*\*\* Gives clean and purified air.

**APPLICATIONS:** 1.Comfort air conditioning, Industrial air conditioning, Cold storage like Fruits and vegetable storage, Food, Drink and Bakery storage.

### IMPORTANT TERMINOLOGY (or) TERMS

**1.Psychrometry:** It deals with the state of atmosphere with respect to moisture content.

**2.Temperature:** Temperature is an important factor that greatly affects human comfort. For year-round human comfort, the surrounding air temperature should be 22<sup>0</sup>C to 25<sup>0</sup>C.

**3.Dry air:** Dry air is a mixture of oxygen and nitrogen without water vapour. It contains 23% oxygen and 77% nitrogen by volume.

**4.Moisture:** It is the water vapour present in the air.

**5.Moist air:** Moist air is a mixture of dry air and water vapour. Depending upon the temperature of air, the quantity of water vapour present in the air will vary.

**6. Dry bulb temperature (DBT):** The actual temperature of gas or mixture of gases is indicated by an error – free thermometer. The reading noted is known as Dry Bulb Temperature (DBT)

**7. Wet Bulb Temperature (WBT) :** It is the temperature obtained by an accurate thermometer having a wick saturated with distilled water when the air steam across the wet bulb flows with a velocity of 270 m/min.

**8. Dew Point Temperature (DPT):** It is the temperature at which the liquid droplets just appear when the moist air is cooled continuously.

**9. Absolute Humidity:** It is the amount of water vapour per unit volume of the gas.

**10. Relative Humidity:** It is the ratio of the actual partial pressure of water vapour in the moist air to the saturation pressure of water vapour corresponding to the dry bulb temperature. For human comfort, the relative humidity should be from 35% to 60%.

**11. Air Purity:** If the air is contaminated, even if it is within the acceptable temperature and humidity ranges, people do not feel comfortable while breathing. Hence, in air-conditioning systems air is first filtered to keep it free from dust, dirt and other impurities.

**12. Air movement and Air circulation:** Even if the temperature, humidity and air purity are satisfactory a certain amount of air circulation is also required for human comfort. In air conditioning systems, a fan is made use for this purpose.

**13. Humidity Ratio:** It is defined as the amount of water vapour in the moist air per unit mass of the dry air in a given volume. It is also called as specific humidity.

**14. Saturated Air:** A mixture of dry air and enough water vapour all at the same dry-bulb temperature is called saturated air.

**15. Degree of Saturation:** It is defined as the ratio of the weight of the water vapour at a given temperature associated with the unit mass of dry air to the weight of water vapour associated with unit weight of saturated air at the same temperature.

### **CLASSIFICATION OF AIR CONDITIONING SYSTEM:**

The air conditioning system is classified into two categories: 1. Comfort Air Conditioning and 2. Industrial Air conditioning.

1. Comfort Air conditioning: 1. Summer 2. Winter 3. Year round air condition.

2. Industrial Air conditioning: 1. Unitary air condition 2. Central air condition.

### **1. COMFORT AIR CONDITIONING:**

The main purpose of comfort air conditioning system is to provide a suitable environment which is comfortable and healthy to the occupants. For human comfort 50% relative humidity and 26°C DBT are found suitable. Examples of comfort air conditioning are conditioning system employed in Houses, Offices, Theatres, Hospitals and Hotels.

**a).Summer air conditioning:** This type of system is meant for summer season. i)the sensible heat of air is reduced by cooling and ii) the water vapour present in air is reduced by dehumidification process.

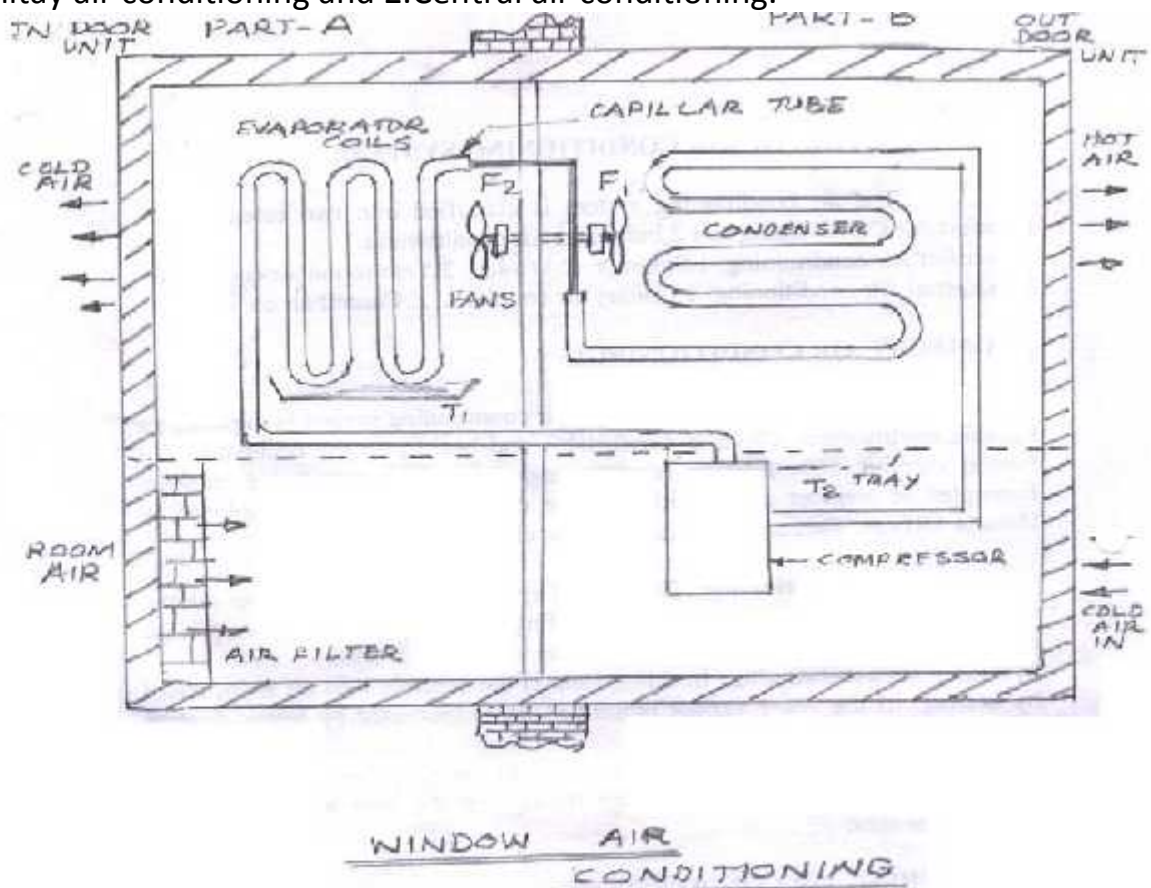
**b)Winter air conditioning:** In this system i) the sensible heat air is increased by heating. ii) the water vapour present in air is increased by humidification process.

**c)Year round air conditioning:** This system controls the temperature and humidity of air of an enclosed space throughout the year according to the seasonal changes:

## 2.INDUSTRIAL AIR CONDITIONING:

The main purpose of industrial air conditioning is to provide air at required temperature and humidity to carry out specific processes in industries. Certain precision machines like jig boring machines whose accuracy is likely to be affected by temperature due to expansion must be kept in air conditioned rooms. Similarly rusting of iron can be prevented if they are kept in air conditioned space. The air conditioning system may also be classified as

1.Unitay air conditioning and 2.Central air conditioning.



These units are installed in windows of the room and therefore these room air conditioners are known as window type air conditioner. They are available in sizes up to 2 tone capacity.

It works on vapour compression cycle. The whole unit of room air conditioner is divided into two parts A and B as shown in figure. The center part of the conditioner is installed in the window facing A part inside the room and B part outside the room with the support of wall brackets. Part A consists of evaporator for cooling the air inside the room and part B consists of condenser which rejects the heat into the atmosphere.

This unit consists of a compressor, condenser, a filter, a drier, a capillary tube and an evaporator.

The high pressure refrigerant vapour from the compressor is passed to the condenser where it is condensed to refrigerant liquid and its latent heat is given out to the air passing over the condenser coils. Coil F1 sucks the air from the atmosphere and drives it to the atmosphere through hot condenser coils.

The Fan F2 draws air from the room into the air conditioner through the filter where the dust is collected and drives this air into the room through evaporator coils. The liquid refrigerant passes through the capillary tubes from the condenser and enters the evaporator at low pressure and low temperature. The air which passes over the evaporator, is cooled to low temperature and gets dehumidified. This dehumidified cool air is then circulated in the room by the fan F2. The quantity of air circulated can be controlled by dampers D1 and D2. The refrigerant evaporates by absorbing heat from the air and enters into the compressor. The same cycle is repeated continuously.

The dehumidified air in the evaporator coil leaves water drops in the tray T1 and is taken to tray T2 by the pipe as shown in the figure. The collected water in the tray T2 evaporates to some extent and cools the compressor and condenser and finally discharged outside.