

Title : Psychrometry

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PPT of Psychrometry

CONTENTS

- ✓ What is PSYCHROMETRY?
- ✓ Properties of PSYCHROMETRY
- ✓ PSYCHROMETRIC Processes
- ✓ PSYCHROMETRIC CHART

Psychrometry

- **Psychrometry** is the science dealing with the physical laws of air – water vapour mixtures.
- When designing an air conditioning system, the temperature and moisture content of the air to be conditioned, and the same properties of the air needed to produce the desired air conditioning effect.
- In other words, we can say that **Psychrometry** is the study of **MOIST AIR** or mixture of dry air and water vapour.

PROPERTIES OF PSYCHROMETRY

- ❖ *DEW POINT TEMPERATURE*
- ❖ *RELATIVE HUMIDITY*
- ❖ *HUMIDITY RATIO*
- ❖ *DRY-BULB TEMPERATURE*
- ❖ *WET BULB TEMPERATURE*
- ❖ *HUMIDITY*
 - *Specific humidity*
 - *Absolute humidity*
- ❖ *PSYCHROMETRIC RATIO*

Dew Point

- The temperature at which moisture starts to condense out of the air is known as **DEW POINT**.
- Dew point is also known as saturation temperature.
- Dew point temperature is determined by moving from a state point horizontally to the left along lines of constant humidity ratio until the upper, curved, saturation temperature boundary is reached.

Dew Point



○ Condensation occurs at the Dew Point Temperature

Relative Humidity

Amount of moisture that a given amount of air **is holding**

Relative Humidity
(percentage)

=

Amount of moisture that a given amount of air **can hold**



Humidity Ratio

- Actual weight of water in an air – water vapour mixture
- Amount of moisture per unit of dry air
- Can be defined as,

$$W = m/G$$



DRY -BULB TEMPERATURE

- The dry-bulb temperature is the temperature indicated by a thermometer exposed to the air in a place sheltered from direct solar radiation. The term dry-bulb is customarily added to temperature to distinguish it from wet-bulb and dew point temperature.

WET BULB TEMPERATURE

- Wet bulb temperature is the temperature recorded by thermometer when the bulb is enveloped by cotton wick saturated with water.
- The accuracy of a simple wet-bulb thermometer depends on how fast air passes over the bulb and how well the thermometer is shielded from the radiant temperature of its surroundings.

THERMOMETERS



Dry Bulb

Measured in degrees
Fahrenheit (°F)



Wet Bulb

HUMIDITY

- **Specific Humidity:**
 - Specific humidity is defined as the proportion of the mass of water vapour per unit mass of the moist air sample (dry air plus the water vapour); it is closely related to humidity ratio and always lower in value.
- **Absolute Humidity:**
 - The mass of water vapor per unit volume of air containing the water vapor. This quantity is also known as the water vapour density.

PSYCHROMETRIC RATIO

- The **psychrometric ratio** is the ratio of the heat transfer coefficient to the product of mass transfer coefficient and humid heat at a wetted surface. It may be evaluated with the following equation:

$$r = h_c / k_y c_s$$

where:

- ✓ r = Psychrometric ratio, dimensionless
- ✓ h_c = convective heat transfer coefficient, $W m^{-2} K^{-1}$
- ✓ k_y = convective mass transfer coefficient, $kg m^{-2} s^{-1}$
- ✓ c_s = humid heat, $J kg^{-1} K^{-1}$

PSYCHROMETRIC PROCESSES

- ❑ SENSIBLE HEATING
- ❑ SENSIBLE COOLING
- ❑ DEHUMIDIFICATION
- ❑ HUMIDIFYING
- ❑ ADIABATIC COOLING
- ❑ ADIABATIC MIXING
(MOIST AIR & WATER VAPOR)

Questions

- What is psychrometry & state its importance for Refrigeration & Air conditioning?
- Enlist the different properties of psychrometric properties.
- Define all the psychrometric properties in detail.
- Explain sensible heating & sensible cooling processes in psychrometry.