



ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

Approved by AICTE and affiliated to Anna University, (An ISO Certified Institution)

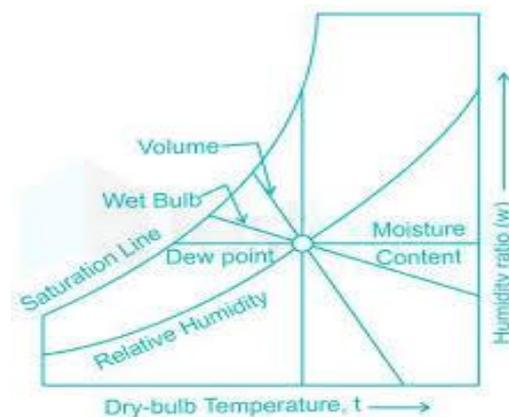
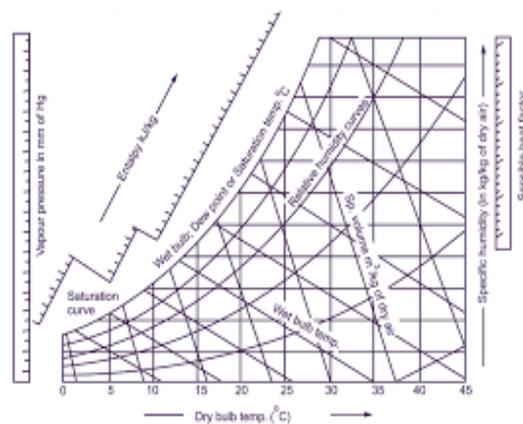
Accredited by NAAC with A+ Grade

DEPARTMENT OF AGRICULTURAL ENGINEERING

AI3601 POST- HARVEST TECHNOLOGY

Dr. A. ARUL MARCEL MOSHI,

ASSOCIATE PROFESSOR / MECH.



UNIT II: PSYCHROMETRY AND DRYING

CO2: To perform drying of agricultural products and analyze performance of dryers.

Psychrometry

- Psychrometry is the science that deals with the study of moist air properties and the relationships between temperature, humidity, dew point, and enthalpy of air-water vapor mixtures.

Importance of psychrometry:

In Post-Harvest Technology, psychrometry is essential for:

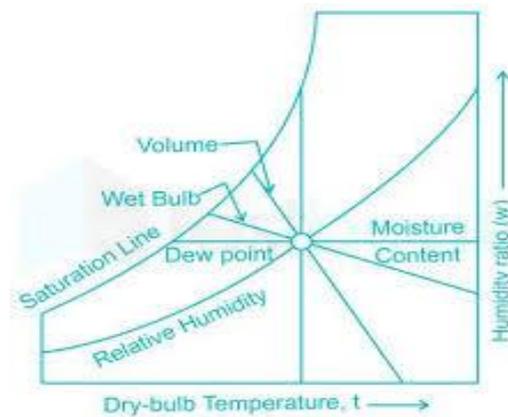
- Designing and managing drying systems for grains, fruits, and vegetables.
- Controlling storage environment (humidity & temperature) to prevent spoilage and maintain quality.
- Calculating cooling loads for cold storage and refrigerated transport.
- Understanding moisture migration and condensation risks in storage structures.
- Operating aeration systems to maintain safe moisture levels in stored grains.

Cooling load & HVAC:

Cooling load: Cooling load is the total amount of heat energy that needs to be removed from a space to maintain a desired, comfortable indoor temperature and humidity level, essentially measuring how hard an air conditioning system must work.

HVAC: HVAC stands for Heating, Ventilation, and Air Conditioning, referring to the systems and technology that control temperature, humidity, and air quality in indoor spaces like homes, offices, and vehicles, ensuring thermal comfort and clean, fresh air.

Key Psychrometric Properties

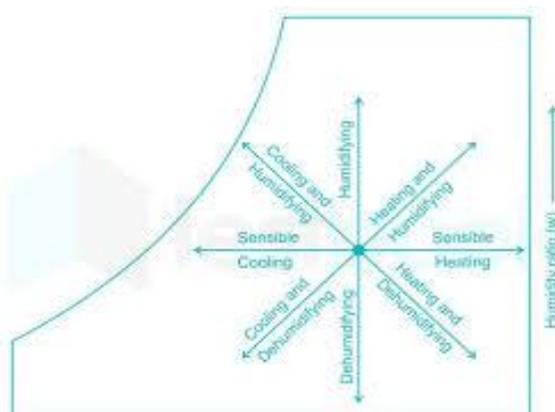


- i) **Dry bulb temperature (DBT):** Dry bulb temperature is the actual air temperature measured by a regular thermometer.
- ii) **Wet bulb temperature (WBT):** Wet bulb temperature is the lowest temperature air can reach through evaporative cooling, measured by a thermometer covered with a wet cloth.
- iii) **Dew point temperature (DPT):** Dew point temperature is the temperature at which air becomes saturated with moisture and water vapor begins to condense into liquid.
- iv) **Relative humidity (ϕ):** Relative humidity (RH) is a measure of the amount of water vapor currently in the air, expressed as a percentage of the maximum amount of water vapor the air can hold at that specific temperature and pressure.
- v) **Specific humidity (ω):** Specific humidity is the ratio of the mass of water vapor per unit mass of the dry air, usually expressed as grams of water vapor per kilogram of air (g/kg).

It is a stable measure of moisture content, indicating the actual amount of water vapor in an air parcel, unlike relative humidity which changes with temperature and pressure.
- vi) **Enthalpy (h):** Enthalpy is the total heat energy contained in moist air. It includes: Heat of the dry air, and Heat of the water vapor (moisture) present in the air.

It helps us know how much energy is needed to heat or cool air. It is used in air-conditioning, heating, and drying processes.
- vii) **Specific volume (v):** Specific volume is the amount of space (volume) that 1 kilogram of dry air, along with the water vapor mixed with it, occupies at a given temperature and pressure.

Psychrometric Processes



- i) **Sensible heating:** Air temperature increases at constant humidity ratio (horizontal right movement on chart).
Use: Pre-heating air before drying.
- ii) **Sensible cooling:** Air temperature decreases at constant humidity ratio (horizontal left movement).
Use: Cooling stored grains without changing moisture content.
- iii) **Humidification:** Moisture is added to air, increasing specific humidity (vertical upward movement).
Use: Maintaining humidity in produce storage.
- iv) **Dehumidification:** Moisture is removed from air, decreasing specific humidity (vertical downward movement).
Use: Reducing moisture in grain storage to prevent spoilage.
- v) **Heating with Humidification:** Air is heated and moisture is added simultaneously (right and upward movement).
Use: Controlled drying where both temperature and humidity are adjusted.
- vi) **Heating with Dehumidification:** Moist air is simultaneously heated and the moisture content has removed.
Use: Prevents mold growth and spoilage in stored crops by reducing air moisture while maintaining safe thermal conditions.
- vii) **Cooling with Humidification:** Air is cooled by evaporating water into it at constant wet-bulb temperature (movement along constant WBT line).
Use: Low-cost cooling in ventilated storage.

viii) Cooling with Dehumidification: Air is cooled and moisture is removed (left and downward movement).

Use: Air conditioning and grain cooling in humid conditions.