ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

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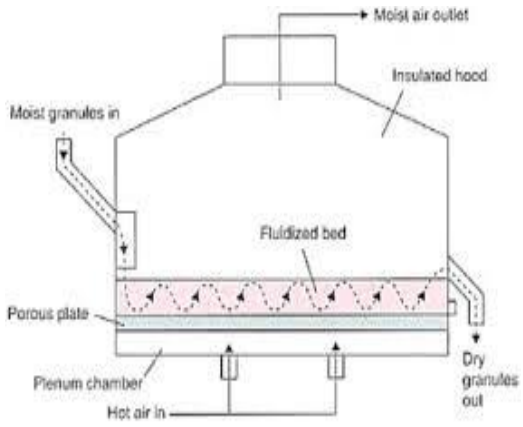
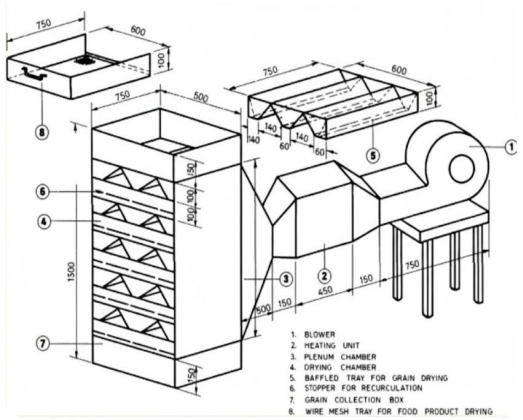
DEPARTMENT OF AGRICULTURAL ENGINEERING

AI3601 POST- HARVEST TECHNOLOGY

Dr. A. ARUL MARCEL MOSHI,

ASSOCIATE PROFESSOR / MECH.





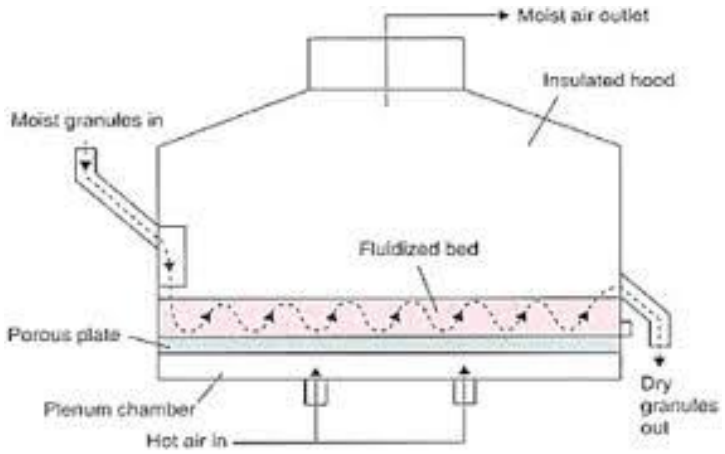
UNIT II: PSYCHROMETRY AND DRYING

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

Fluidized Bed Dryers

A fluid bed dryer is a widely used industrial drying system that employs a stream of heated air to suspend and fluidize solid particles, promoting rapid and uniform moisture removal. This efficient drying method is particularly valued in pharmaceutical, chemical, and food processing industries for its ability to handle heat-sensitive materials while reducing drying time and improving product quality.

Working principle:



- Wet material is placed on a perforated bed.
- Hot air is blown upward at high velocity through the bed.
- The particles are lifted and suspended, forming a fluidized state.
- Continuous air contact removes moisture rapidly and uniformly.
- Dried material is collected after reaching the required moisture content.

Advantages:

- It provides very fast and uniform drying.
- Heat and mass transfer efficiency is high.
- It requires less drying time compared to other dryers.

Limitations:

- It has high initial and operating costs.
- It is not suitable for large or sticky materials.
- Fine particles may be lost with the exhaust air.

Applications:

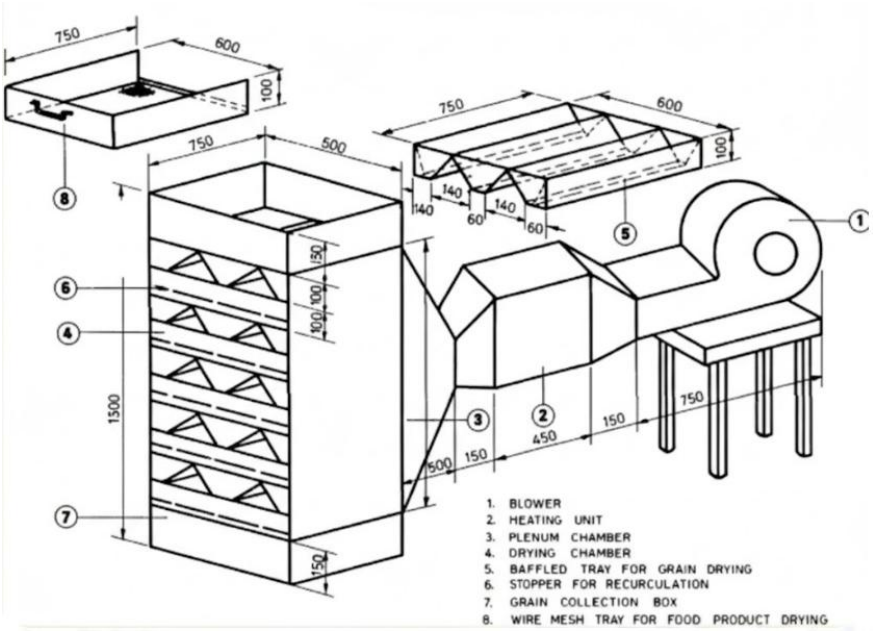
- Used for drying grains, seeds, and powdered agricultural products.
- Used in food processing industries for drying spices and starch.
- Used in pharmaceutical and chemical industries for drying granules.

LSU Dryers

- LSU dryers are continuous-flow grain drying systems originally developed at Louisiana State University.
- They use a column design where grain moves downward while heated air is forced horizontally across it to remove moisture efficiently.
- These dryers are known for their compact design, high capacity, and uniform drying, making them popular in commercial agriculture.
- It is a continuous type of dryer.
- It consists of a rectangular chamber, holding bin, blower with duct, grain discharging mechanism and air heating system.
- Its capacity varies from 2-12 tonnes.
- Recommended air flow rate is 60-70 m^3/min/tonne.
- Recommended air temperature: 60º C (Raw paddy) and 85º C (parboiled paddy).

Working principle:

- Hot air is blown horizontally across a vertical column of grain as it flows downward by gravity.
- The grain moves slowly and continuously through multiple drying sections (tempering zones) in the column.
- Moisture is evaporated from the grain surface in the drying sections, then allowed to equalize in the tempering zones.



- The process repeats in stages, preventing stress cracks by gradually reducing moisture content.
- Cool air is often introduced at the bottom to lower grain temperature before discharge.

Advantages:

- Uniform drying can be achieved.
- It is suitable for drying rice with good quality retention.
- Can be used for different types of grains.

Limitations:

- The equipment is relatively costly.
- It requires skilled operation and careful control
- It consumes more energy compared to simple dryers.

Applications:

- **Grain drying** – Efficiently dries bulk grains like rice, wheat, corn, and soybeans after harvest.
- **Seed conditioning** – Gently reduces moisture in seeds while preserving germination quality.
- **Commercial and cooperative agriculture** – Used in large-scale farming and grain storage facilities for continuous, high-capacity drying.