

PROTECTED CULTIVATION AND POST
HARVEST TECHNOLOGY
(ASAE3204)
TYPES OF DRYER

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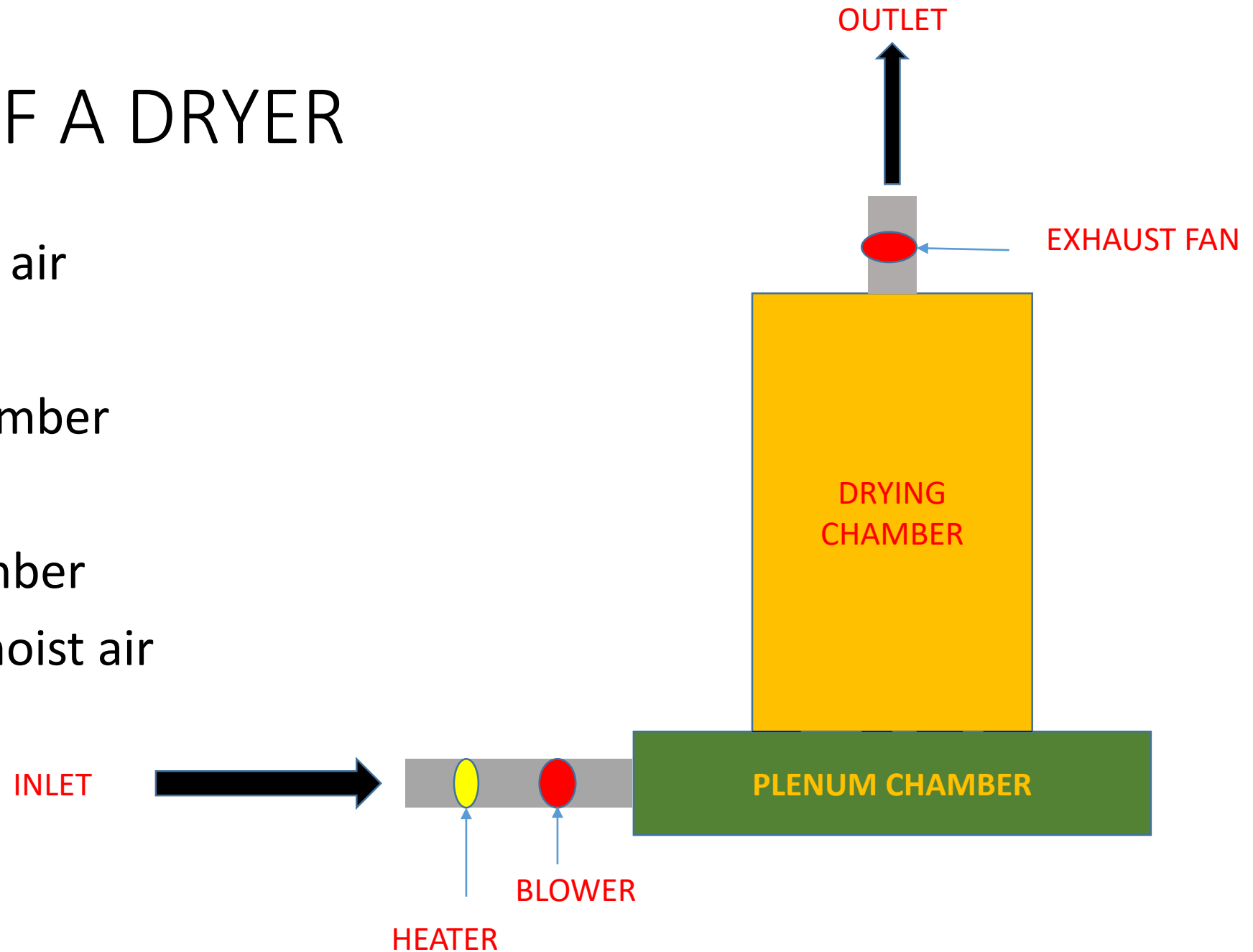
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DRYER

A dryer is a mechanical device or machine that removes the water from wet grains by forcing either ambient air or heated air through the grain bulk.

PARTS OF A DRYER

- Inlet for hot air
- Distributor
- Plenum chamber
- Drying bed
- Drying chamber
- Outlet for moist air



SUN DRYING

1. The process required no fuel.
2. Operation is simple
3. Labour oriented and time consuming.
4. No pollution
5. Completely dependant on weather
6. Excessive loses due to shattering, birds, rodents
7. Requires specially constructed large floor space.
8. Entire process is unhygienic
9. Unable for handling large quantity of grain within a short period of harvest.

MECHANICAL DRYING

1. The process is requires fuel or power.
2. The process is automatic and
3. Requires one/two trained person and less time consuming .
4. Produce some pollution
5. Grain can be dried in all seasons and during night.
6. Losses avoided.
7. It requires less floor room
8. It is hygienic.
9. Can handle huge amount of grain

BATCH DRYER

- Batch dryer is a system at which a certain volume of grain is being dried at a time.
- Mostly used for on-farm drying.

ADVANTAGES

- Intermittent drying can also be used.
- Price is less.
- Operation is very simple.
- It can be manufactured locally by using various type of material like steel sheets, wood pieces etc.

DISADVANTAGES

- Drying is non-uniform drying which results higher percentage of broken grains.
- Volume is fixed.
- Require more drying time.
- Rate of drying is slow.

CONTINUOUS DRYER

- In Continuous dryer the dried grains continuously flow without stopping.
- Generally used in relatively large grain complexes.

ADVANTAGES

- Drying is uniform.
- Volume is not fixed.
- Rate of drying is faster.
- Require less drying time as compare to batch dryer.

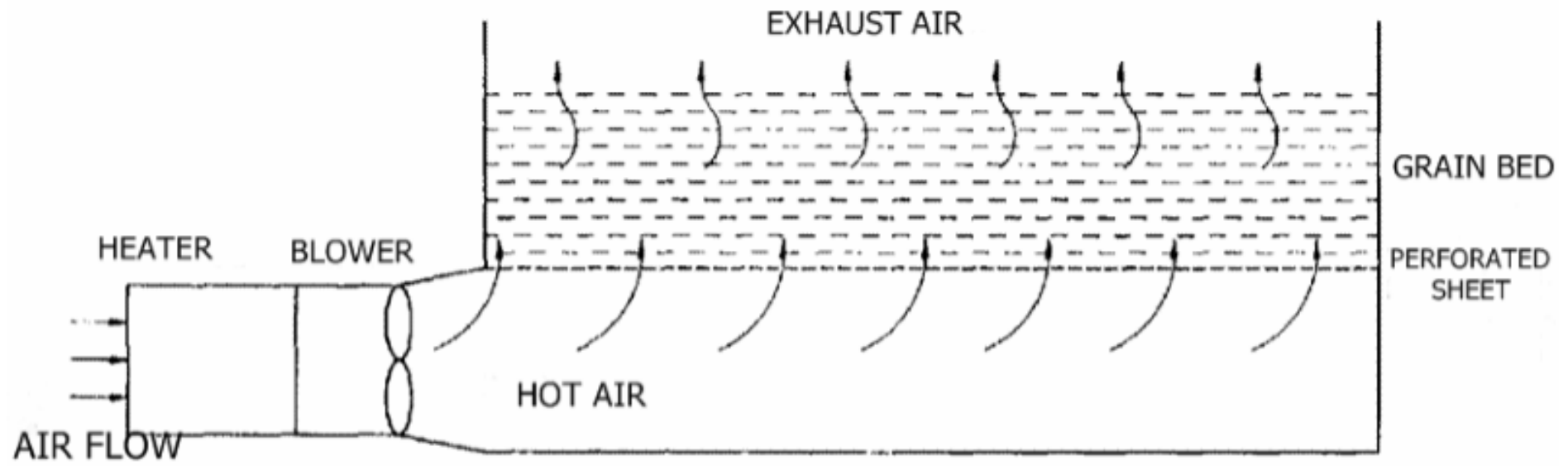
DISADVANTAGES

- Intermittent drying can't be used.
- Price is comparatively more than batch dryer.
- The operation is not so simple and the operator must have knowledge about grain drying management.
- It can't manufactured locally, requires specialized unit.

FLAT BED DRYER

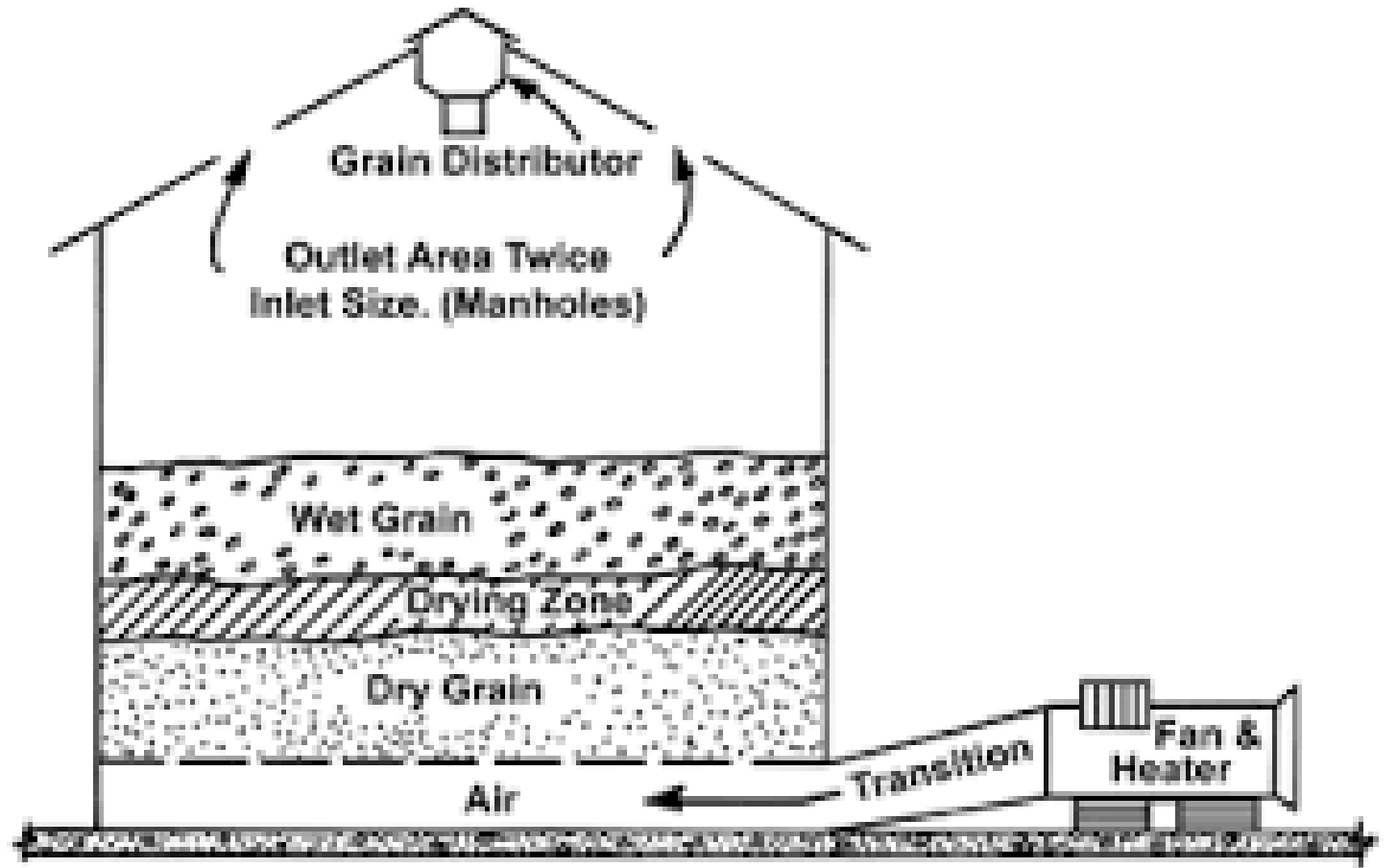
- The Flat Bed batch type dryer is similar to deep bed dryer except that the surface area of the dryer is more and the depth of the drying layer is less.
- These dryers are usually of 1-2 tonnes capacity.
- They are designed for farm level operation.
- Grain are spread 0.6 to 1.2m deep over the perforated floor and dried.
- The temperature of the heated air should be limited to 43° C

FLAT BED DRYER



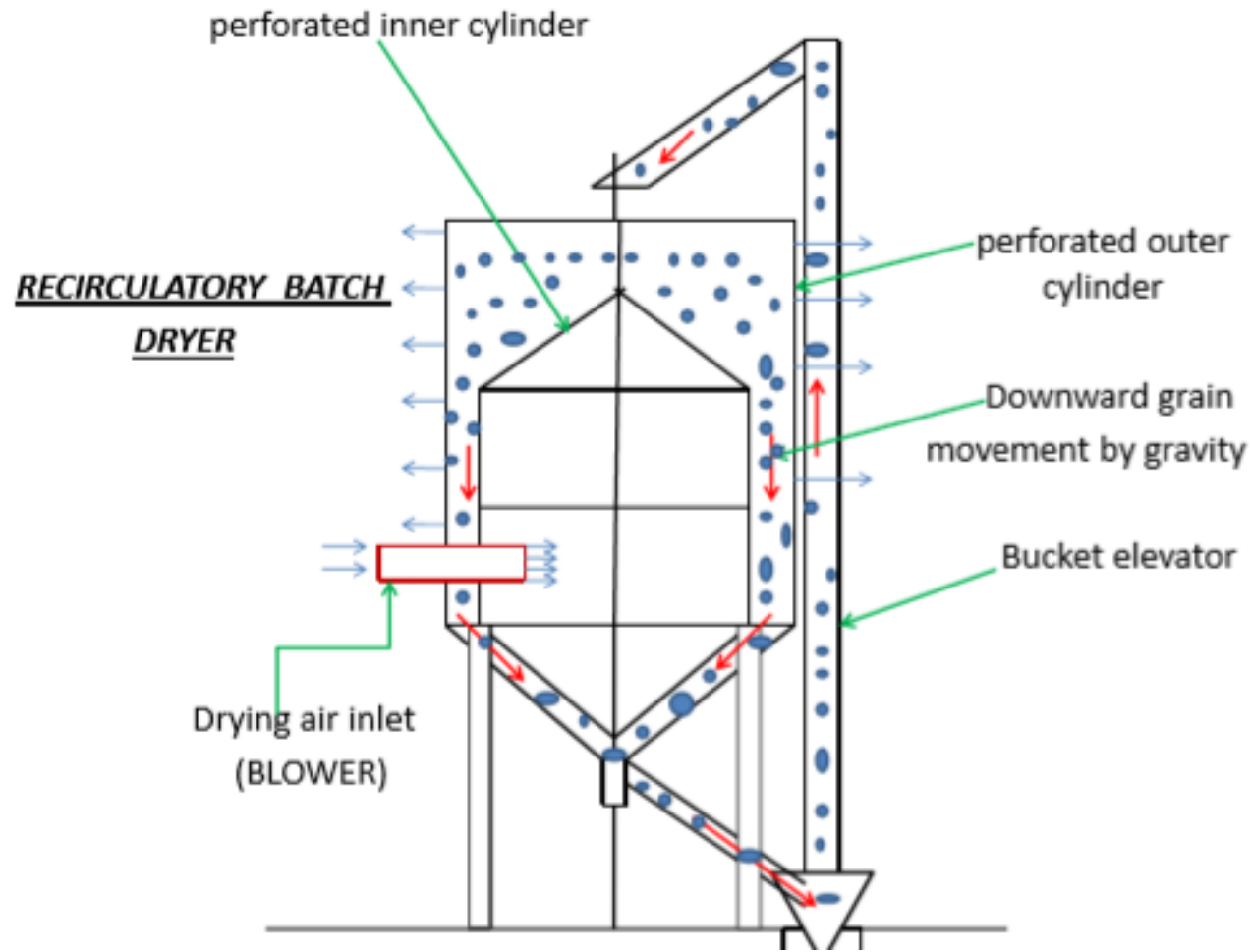
BIN DRYER

- It is a deep bed dryer.
- Bed depth > 15 cm.
- It is a high capacity, low cost dryer.
- It is a large, cylindrical container fitted with a mesh base.
- Drying air enters through mesh base and exits at the top.
- A heater is provided to heat the air.
- The air velocity through bed of food is 0.5m/s-m^2 .
- Applications:
 - Food grains, seeds, spices.



RECIRCULATORY DRYER

- In a re-circulating dryer the same quantity of grain is recycled through the dryer until final moisture content is reached.
- Recirculatory batch dryer is a continuous flow non mixing type of grain dryer.
- The hot air from the plenum passes through the grain moving downward by gravity and comes out of the outer perforated cylinder.

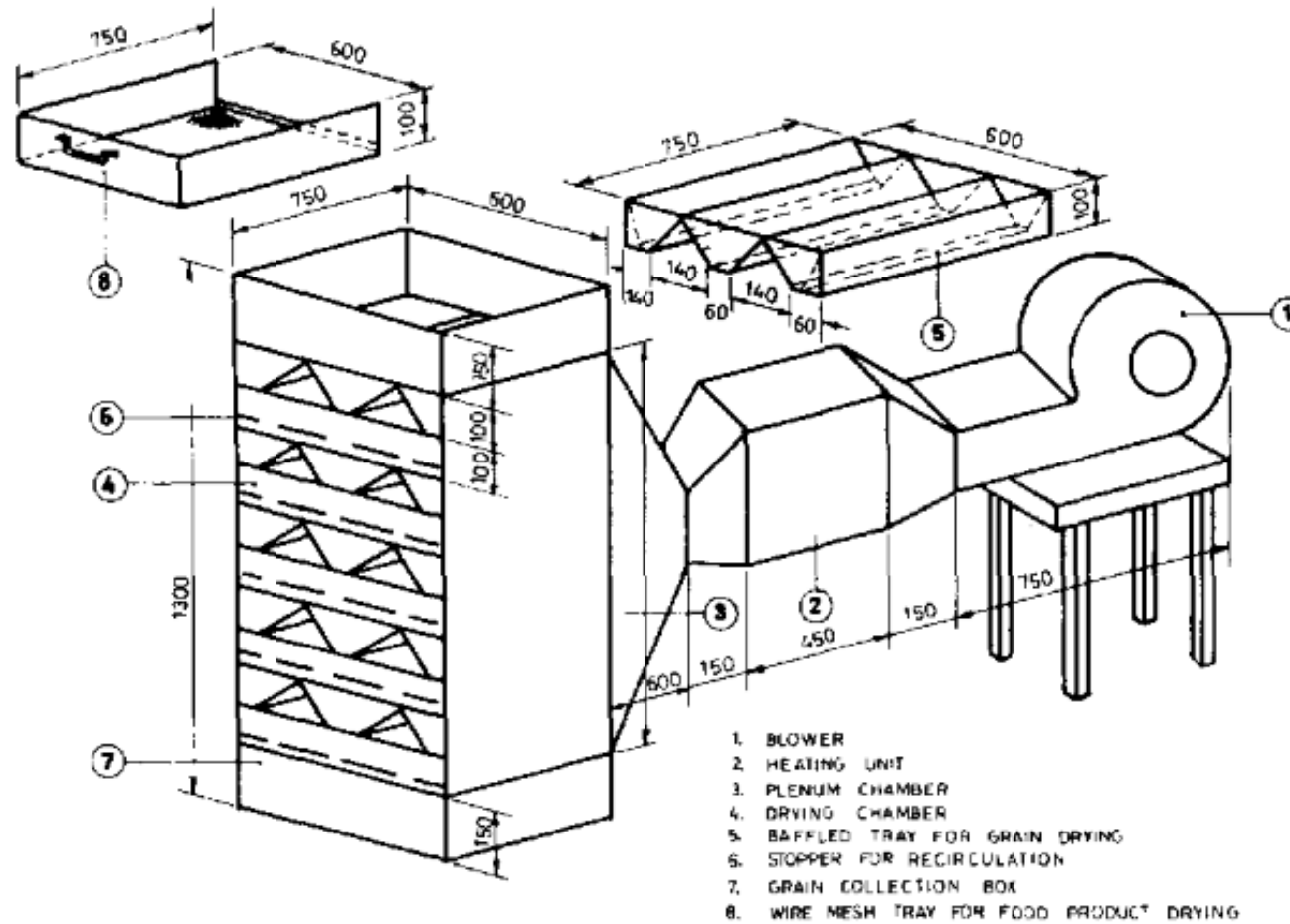


LSU DRYER

LSU DRYER

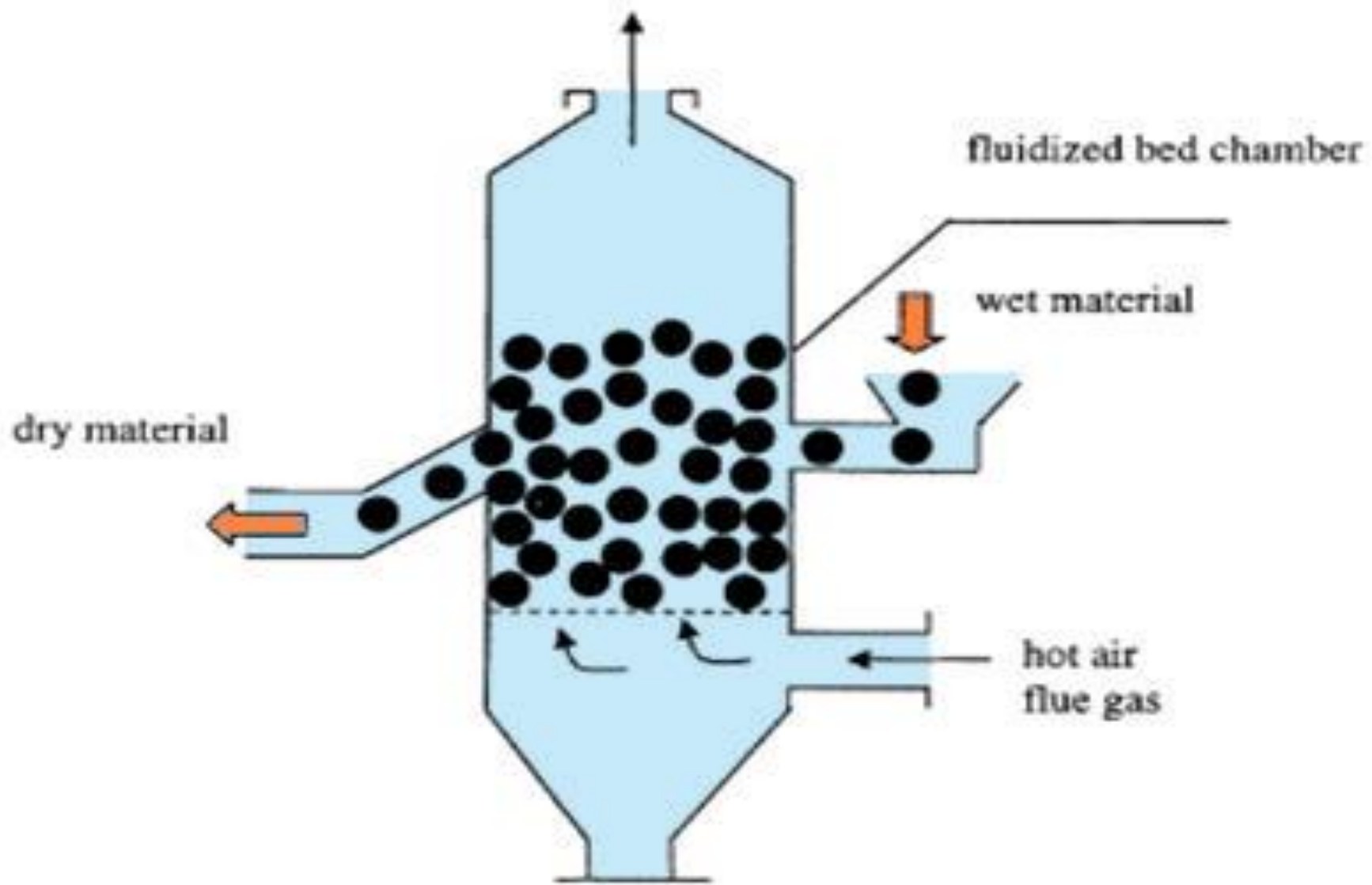
- Developed at Louisiana state university (LSU) for rice to ensure good mixing & good air to grain contact .
- It is a **Continuous mixing** type of dryer .
- Consists of rectangular chamber, holding bin, blower with duct, grain discharging mechanism and air heating system. Capacity varies from 2-12 tonnes.
- Recommended air flow rate is 60-70 m³/min/tonne
- Air temperature are 60 & 85°C for raw & parboiled paddy .
- Uniformly dried product can be obtained.
- Can be used for different types of grain.
- High capital investment

LOUISIANA STATE UNIVERSITY (LSU) Continuous Flow Dryer.

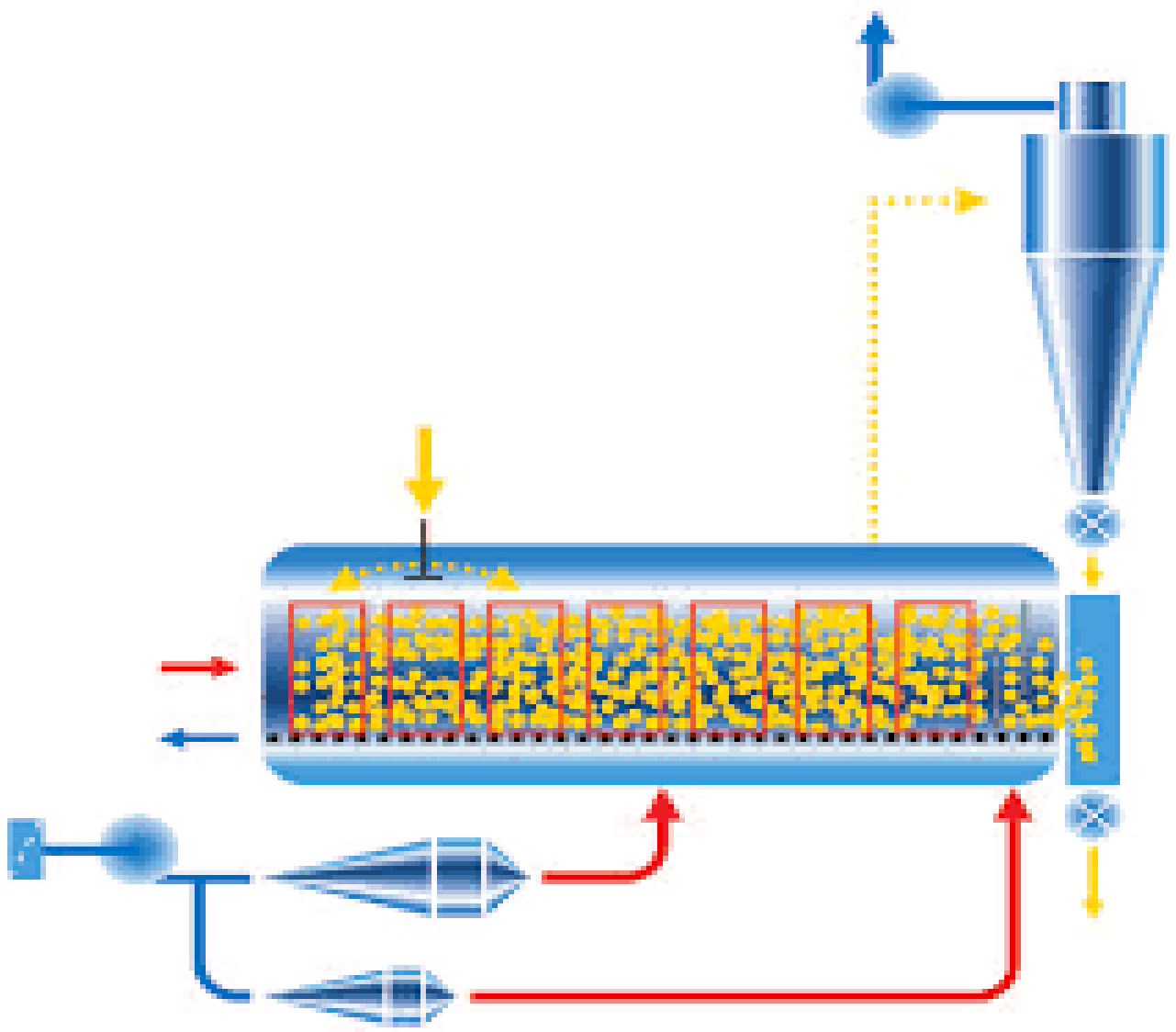


FLUIDIZED BED DRYER

- The airflow through the bed of product is kept at a level such that the product is lifted and is in the suspended form during drying.
- In **continuous types**, wet feed is admitted to the top of the bed and dried product is taken out from the bottom.
- The tray vibrates to move the food under gravity from one tray to next.
- In **batch type**, the wet feed is kept on the perforated bed and is exposed to hot air in fluidized chamber until it gets dried.
- A distributor is present to distribute air at uniform velocity.
- Plenum chamber is present for uniform distribution of hot air.



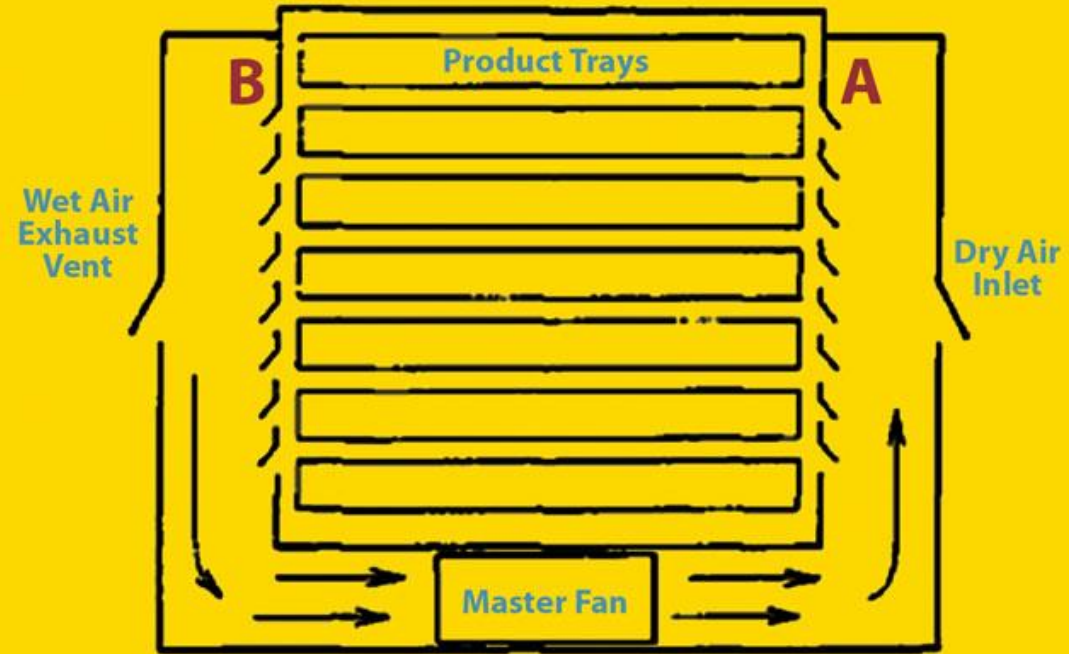
- If fine particles are present, then cyclones are needed for fine recovery.
- Drying rate is good.
- Uniform mixing is achieved.
- High thermal efficiency and drying rates.
- The food products should not clump or stick to each other.
- The food product must withstand the agitation without product degradation.
- Application:
 - Used for granulated powder.
 - Eg: pea, starch powder, diced vegetables.



TRAY DRYER

- Also known as cabinet dryer.
- It is a rectangular chamber made up of steel which is insulated.
- Trays are placed one above the other and products are spread on the tray uniformly to a height of 0.1-1 cm.
- It consists of a fan, a heater and thermostatic control to heat air to desired temperature.
- Baffles are also provided.
- Moist air is continuously vented out with help of exhaust fan.
- Generally 10-20% of the air is fresh air and reminder is circulated air.

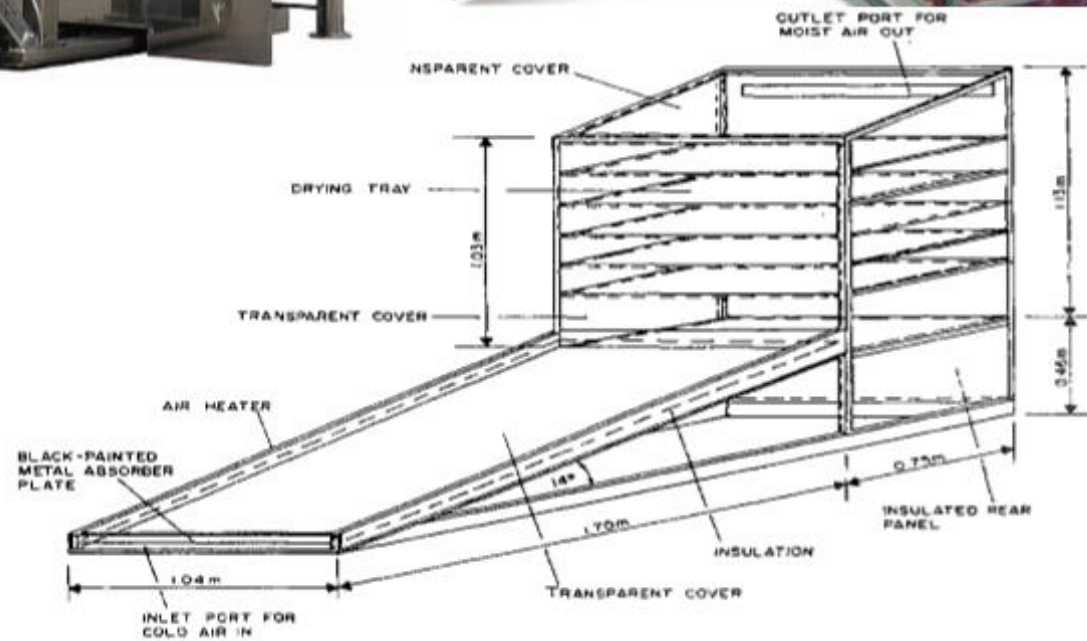
Tray Dryer



Opening/Closing Controlled By Humidistat

A - Inlet Vents
B - Exhaust Vents

TRAY/CABINET DRYER



ASSISGNMENT

- Difference between drying and dehydration
- Difference between flat bed and deep bed dryer