SNS COLLEGE OF TECHNOLOGY
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Unit 2 – Topic 6

Thin layer and deep bed drying

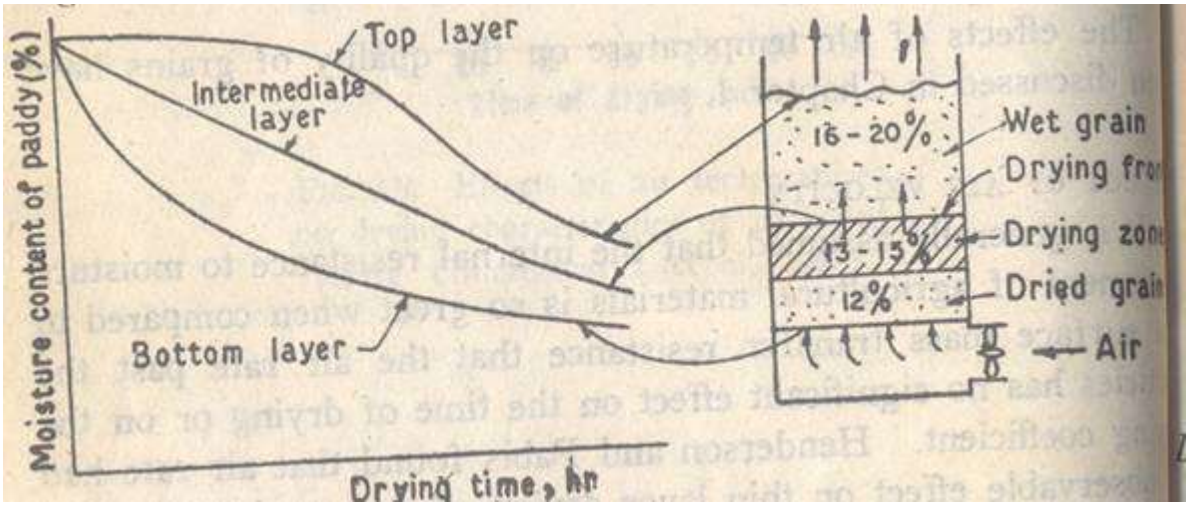
Thin layer drying

- Process in which all grains are fully exposed to the drying air under constant drying conditions i.e. at constant air temp. & humidity.
- Up to 20 cm thickness of grain bed is taken as thin layer
- All commercial dryers are designed based on thin layer drying principles
- Represented by Newton's law by replacing moisture content in place of temperature

M-Me/Mo-Me = e -Kq
M – Moisture content at any time q, % db
Me- EMC, %db
Mo – Initial moisture content, %db
K – drying constant
q - time, hour

Deep bed drying

- All grains are not fully exposed to the same condition of drying air
- Condition of drying air changes with time and depth of grain bed
- Rate of airflow per unit mass of grain is small
- Drying of grain in deep bin can be taken as sum of several thin layers
- Humidity & temperature of air entering & leaving each layer vary with time
- Volume of drying zone varies with temp & humidity of entering air, moisture content of grain & velocity of air



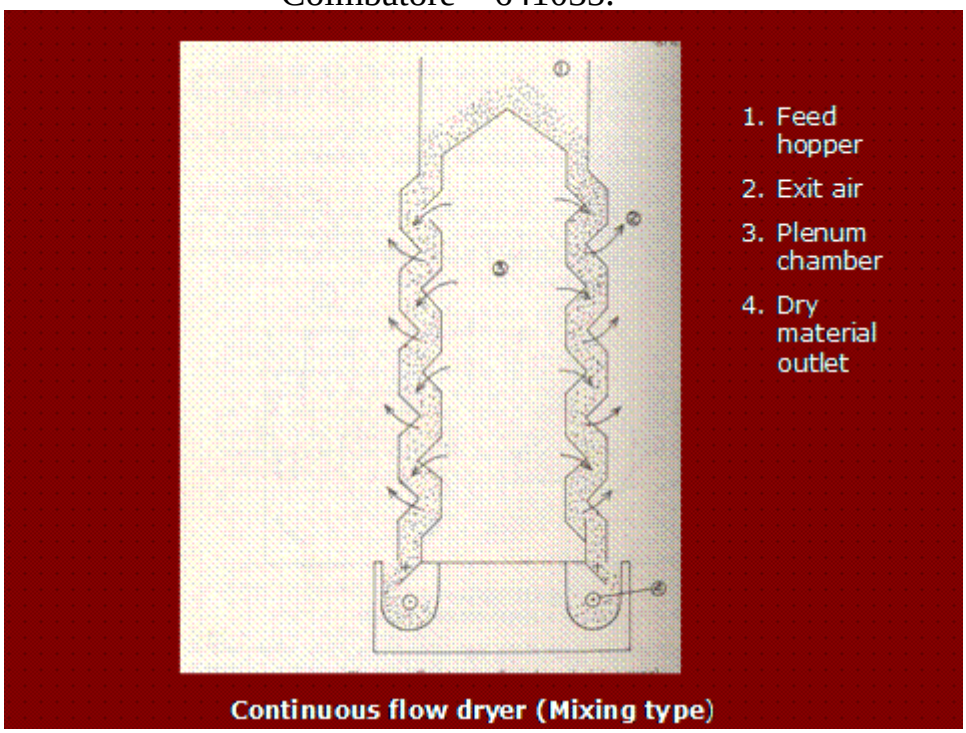
Deep bed drying characteristics at different depths

Continuous flow dryer

- Columnar type dryer in which wet grains flow from top to the bottom of the dryer
- Two types
  - Mixing
  - Non-mixing

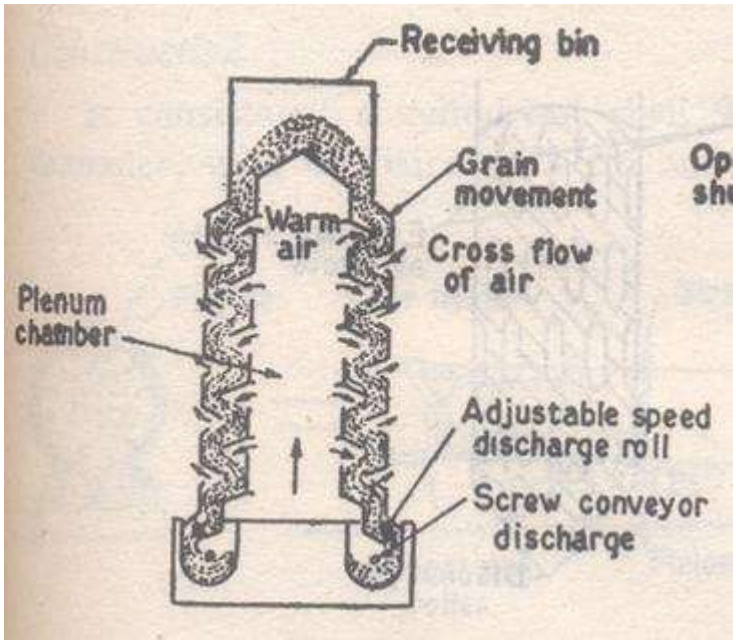
Mixing

- Grains are diverted in the dryer by providing baffles
- Use low air flow rates of 50-95 m3/min/tonne
- Zig-zag columns enclosed by screens are used to achieve mixing
- High drying air temperature of 65°C is used



Baffle dryer

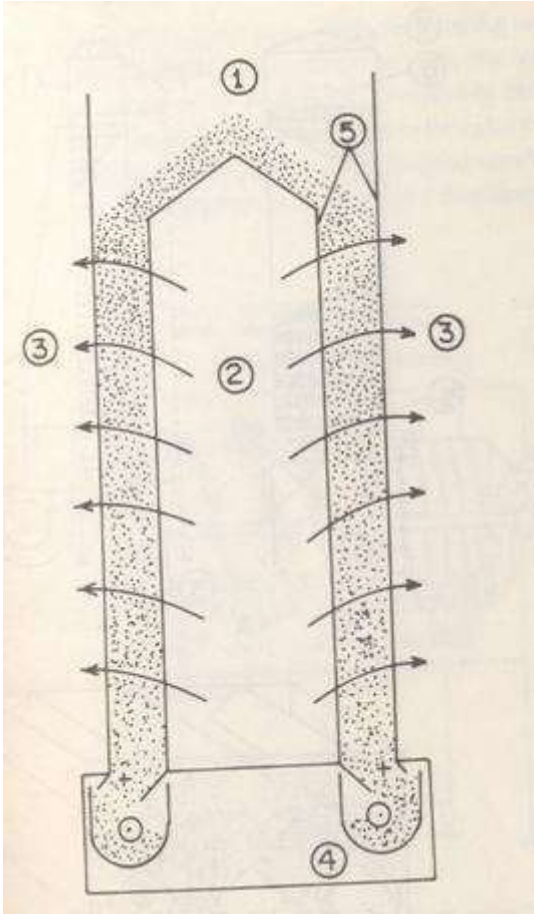
- Continuous flow mixing type dryer
- Consists of receiving bin, drying chamber fitted with baffles, plenum fitted with hot air inlet
- Baffles are fitted to divert the flow & also for mixing
- Grain fed at the top & move downward in a zig-zag path where it encounters a cross flow of hot air
- Bucket elevator is used to recirculate the grain till the grain is dried to desired moisture level
- Uniformly dried product is obtained



Mixing type baffle dryer

Non-mixing

- Grains flow in a straight path
- Baffles are not provided and drying takes place between two parallel screens
- High airflow rates can be used
- Drying air temp. of 54°C is used

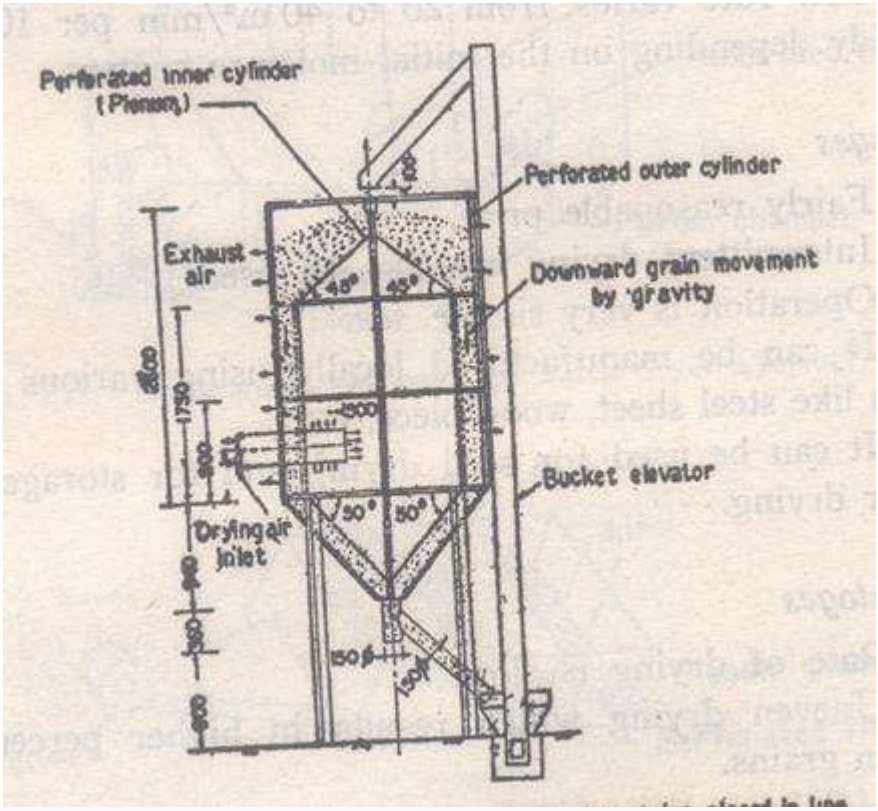


- Feed hopper
- Plenum chamber
- Exit air
- Dry grain outlet
- Screened grain column

Continuous flow dryer (Non-mixing)
Recirculatory Batch dryer

- Continuous flow non mixing type
- Consists of 2 concentric circular cylinders, set 15-20 cm apart

Bucket elevator is used to feed & recirculated the grain
Centrifugal blower blows the hot air into the inner cylinder, acts as a plenum
Grain is fed at the top of the inside cylinder; comes in contact with a cross flow of hot air
The exhaust air comes out through perforations of the outer cylinder
Grain is recirculated till it is dried to desired moisture content
Drying is not uniform as compared to mixing type



Recirculating batch dryer