Differential and Cumulative Analysis Continued

Storage of Solids

Types of storage

- Bulk storage (piles)
- Bin storage (Bin, silo, hopper)

Bulk storage

- Coarse solids like grand and coal are stored outside in large piles, unprotected from weather.
- 100 or 1000 tonne of materials are involved.
- solid stored or removed from pile by tray line or fracter shovel and delivered through the conveyor to the process
- Outdoor storage may lead to environmental problems such as dusting, leching of soluble material from the pile, dusting can be avoided by giving a protect cover to the stored solid leaching.

Bin storage

- Solids are for valuable or 2 soluble to expose it outdoor.
- Piles are stored in bins, silos, hoppers.

Bin -> cylindrical structure built in meal concrete

Silo -> tall and relatively small in diameter

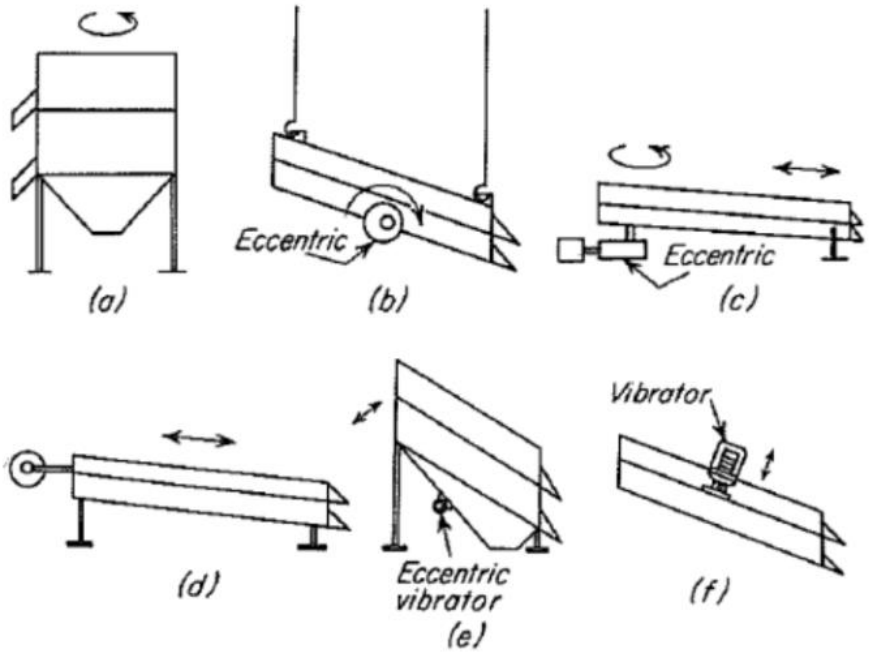
Hopper -> Bin, slopping bottom for temporary storage

Angle of repose

Granular solids are piled up on a flat surface; the sides of the pile are at a definite reproducible angle with the horizontal. The angle α_r angle of repose.

For free flowing granular solids -> 15^0 and 30^0

Screening Equipments



Motions of screens:

(a) Gyrations in horizontal plane

(b) Gyrations in vertical plane

(c) Gyrations at one end shaking to the other end

(d) Shaking

(e) Mechanically vibrated

(f) Electrically vibrated

Types of Screening Equipments

- Grizzlies (fixed inclined screens) are used for the coarse screening of large lumps.
- Trommels (revolving screens) are generally used for fairly large particles.
- Shaking and vibrating screens are used in a coarse range and also down into fine meshes (fine sizing).
- Oscillating screens are used for the finer meshes below 4 mesh.

Grizzlies / Grizzly Screens

Construction:

- Grid of parallel metal bars set in an inclined stationary frame, with slope of 30 to 45°.
- Slope and the path of the material are parallel to the length of the bars.
- The length of the bar may be upto 3m and the spacing between the bars is 50 to 200 mm.

- Material of construction of the bars is manganese steel to reduce wear.
- Bar is shaped in such a way that its top is wider than the bottom.
- It can be made fairly deep for strength without being choked by lumps passing part way through them.

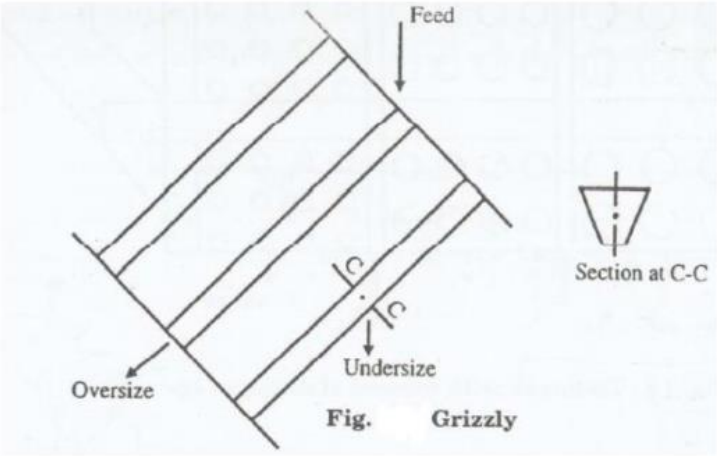


Fig. Grizzly

Working

- A coarse feed is fed at the upper end of the grizzly.
- Large chunks roll and aside to the lower end while small lumps having size less than the opening in the bars fall through the grid into a separate collector.
- If the angle of inclination to the horizontal is greater, greater is the output but the lower is the screen efficiency.

Advantages

• Simplest of all separating devices.

• Requires no power.

• Least expensive to install and maintain.

Trommels

Construction

It consisting of a cylindrical frame surrounded by wire cloth or perforated plate.

• They are open at one or both ends.

• Inclined at a slight angle to the horizontal so that the material is advanced by the rotation of the cylinder.

• It revolve at relatively low speeds of 15 to 20 rpm.
• Perforations in the screening surface may be of the same size throughout or may be of different size in which the small size perforation section is near the feed end. • It is driven at the feed end through a gear mechanism.
• It has a feed point at the upper end, an undersize product discharge below the screening surface and a oversize discharge at the opposite end.

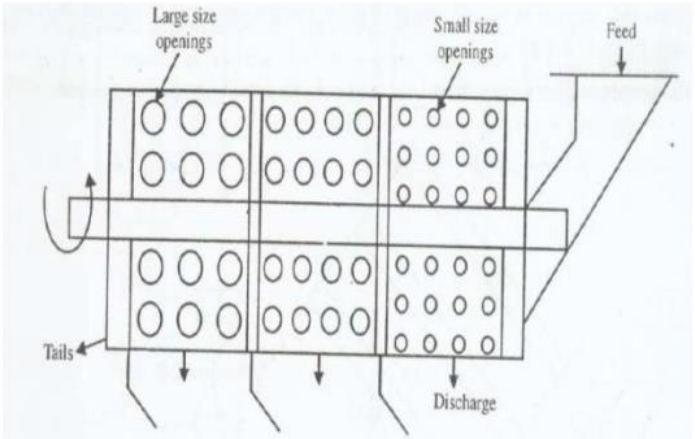


Fig. : Trommel (with screens of different openings)

Working

- The material to be screened is fed at the upper end and gradually moves down the screening surface towards the lower end.
- As the material passes over the aperture gradually increasing size.
- If the single cylinder provided with the screen having three different size perforations then we get four fractions.
- The finest material is collected as the underflow in the compartment near feed end and the oversize material is withdrawn from the discharge end.
- Such type of arrangement is usually adopted for smaller capacities.

Comparison of Grizzlies and Trommels

Grizzlies	Trommels
Stationary inclined screens	Revolving screens
Screen is a grid of metal bars	Screen is a perforated cylindrical member
Openings in screen are large	Openings in screen are small
They handle large size feed	They handle small size feed
Capacity is large	Capacity is relatively small
Labour requirement is large	Labour requirement is low
Cheap construction	Relatively expensive construction

Vibrating screens

Screens which are rapidly vibrated with small amplitude keep the material moving and prevent binding as far as possible. Vibrating screen are commonly used in industry where large capacity and high efficiency are desired. These screens are classified as mechanically vibrated screens and electrically vibrated screens.

Operation

- Vibrations are given to screen to effect the separation of solid particles in to size fractions.
- Vibrating screen three decks.

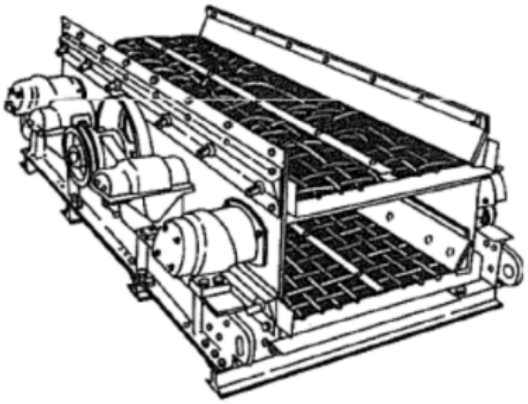
]Variables in screening operation

• Method of feeding-m material should spread
• Screening surface –angle speed amplitude of vibration
• Screen slope
• Vibration amplitude and frequency
• Moisture in the feed

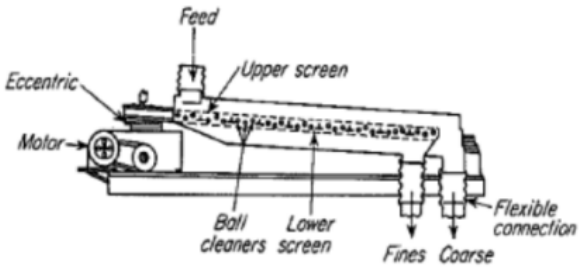
GYRATING SCREENS

A heavy duty gyrating screen is shown in figure. Two screens one above the other are held in a casing inclined at an angle between 16^0 and 30° with the horizontal. The feed mixture is dropped on the upper screen neat its highest point. Casing and screens are gyrated in a vertical plane about a horizontal axis by an eccentric that is set halfway between the feed point and the

Finer screens are usually gyrated at the feed end in a horizontal plane. The discharge end reciprocates but does not gyrate. This combination of motions stratifies the feed so that fine particles travel downward to the screen surface, where they are pushed through by the larger particles on top. Often the screening surface is double and between the two screens are rubber balls held in separate compartments. As the screen operates, the balls strike the screen surface and free the openings of any material that tends to plug them. Dry, hard, round or cubical grains ordinarily pass without trouble through screens.



(a)

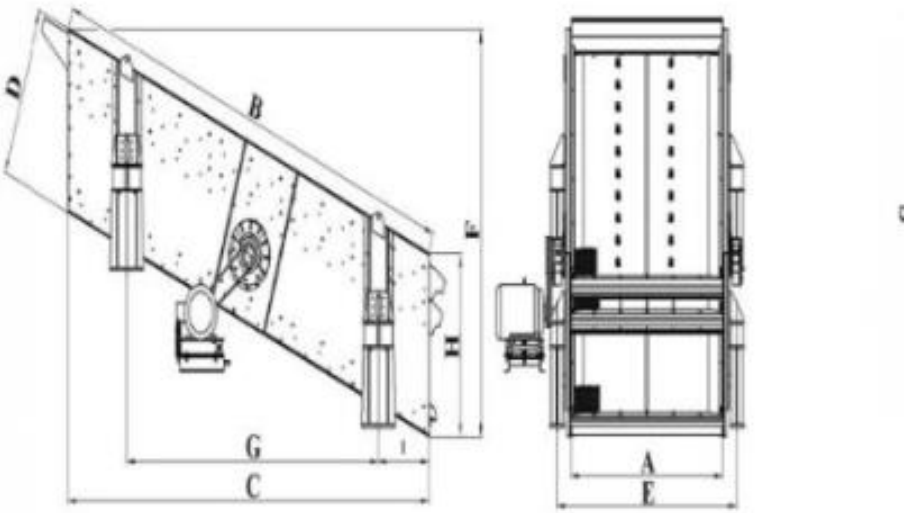


(b)

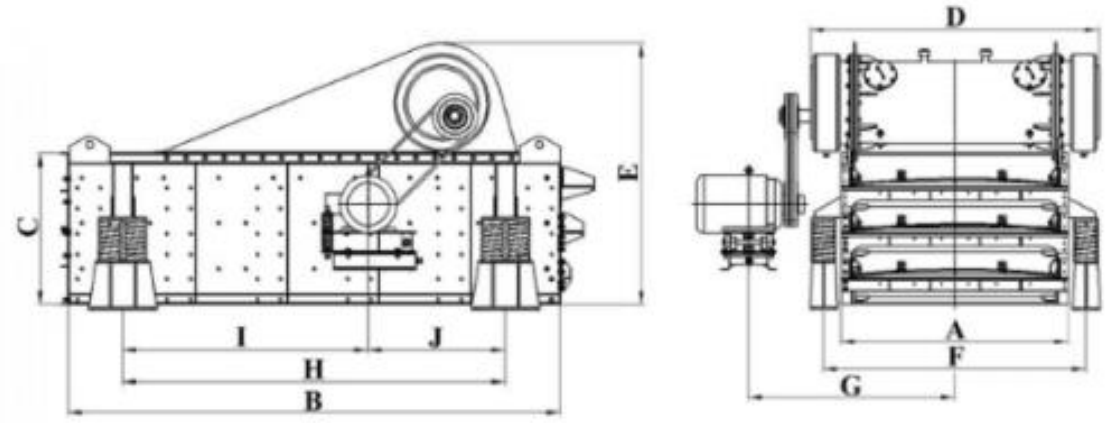
VIBRATING SCREENS

Screens are raplidly vibrated with small amplitude are less likely to blind than are gyrating. The vibrations may be generated mechanically or electrically. Mechanical vibrations are usually transmitted from high speed eccentrics to the casing of the unit and from there to steeply inclined screens. Electrical vibrations from heavy duty solenoids are transmitted to the casing or directly to the screens. Figure shows a directly vibrating screens. Between 1800 and 3600 vibrations per minute are usual

Inclined vibrating screens



Horizontal vibrating screens



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