

# **Size Separation:**

## **Size separation by sifting and official standard for powders**

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# Size Separation

A special technique is used to separate particles of specified size which is known as the "process of size separation".

## OFFICIAL STANDARDS FOR POWDERS

Standards for powders for pharmaceutical purposes are laid down principally in the Indian Pharmacopoeia which states, that the degree of coarseness or fineness of a powder is differentiated and expressed by the size of the mesh of the sieve through which the powder is able to pass. The I.P. specifies five grades of powder which are as under:

### 1. Coarse powder :

A powder of which all the particles pass through a sieve with nominal mesh aperture of 1.70 mm (No. 10 sieve) and not more than 40.0 percent through a sieve with nominal mesh aperture of 355  $\mu\text{m}$  (No. 44 sieve) is called coarse powder.

## **2. Moderately coarse powder:**

A powder of which all the particles pass through a sieve with nominal mesh aperture of  $710\ \mu\text{m}$  (No. 22 sieve) and not more than 40.0 percent through a sieve with nominal mesh aperture of  $250\ \mu\text{m}$  (No. 60 sieve) is called moderately coarse powder.

## **3. Moderately fine powder :**

If all the particles of a powder pass through a sieve with nominal mesh aperture of  $355\ \mu\text{m}$  (No. 44 sieve) and not more than 40.0 per cent through a sieve with nominal mesh aperture of  $180\ \mu\text{m}$  (No. 85 sieve), it falls in this group.

## **4. Fine powder :**

In case all the particles pass through a sieve with a nominal mesh aperture of  $180\ \mu\text{m}$  (**No. 85 sieve**), it is called fine powder.

## **5. Very fine powder :**

If all the particles of the powder pass through a sieve with a nominal mesh aperture of  $125\ \mu\text{m}$  (**No. 120 sieve**), it is said to be very fine powder.

# SIEVES

Sieves for pharmacopoeial testing are constructed from wire cloth with square meshes, woven from wires of brass, bronze, stainless steel or any other suitable material. The wires should be of uniform circular cross-section and should not be coated or plated. There should not be any reaction between the material of the sieve and the substance which is being sifted from it.



Standards for sieves used for pharmacopoeial testing must specify the following:

**1. Number of sieve :**

Sieve number indicates the number of meshes in a length of 2.54 cm in each transverse direction parallel to the wires.

**2. Nominal size of aperture :**

Nominal size of aperture indicates the distance between the wires. It represents the length of the side of the square aperture. The I.P. has given the nominal mesh aperture size for majority of sieves in mm or in cm.

**3. Nominal diameter of the wire :**

Wire mesh sieves are made from the wire having the specified diameter in order to give a suitable aperture size and sufficient strength to avoid distortion of the sieve.

#### **4. Approximate percentage sieving area :**

This standard expresses the area of the meshes a percentage of the total area of the sieve. It depends on the size of the wire used for any particular sieve number. Generally the sieving area is kept within the range of 35 to 40 per cent in order to give suitable strength to the sieve.

#### **5. Tolerance average aperture size :**

Some variation in the aperture size is unavoidable and when this variation is expressed as a percentage, it is known as the 'aperture tolerance average'.

# SIEVING METHOD

- In this method, the fine powder is separated from the coarse powder by using sieves of desired number.
- The degree of fineness of a powder is known with the help of sieve through which the powdered material is passed.
- Sieves are numbered in order to distinguish from each other. Size separation of powder is done by passing the powdered material through a set of sieves.
- Sieves are arranged in descending order *i.e.* sieve of larger size is at the top and the smallest one at the bottom. The bottom sieve is attached to the receiving pan.
- The material is placed in the uppermost sieve. The sieves are shaken with the help of mechanical sieve shaker or electromagnetic devices. It helps the particles to pass through the sieves.

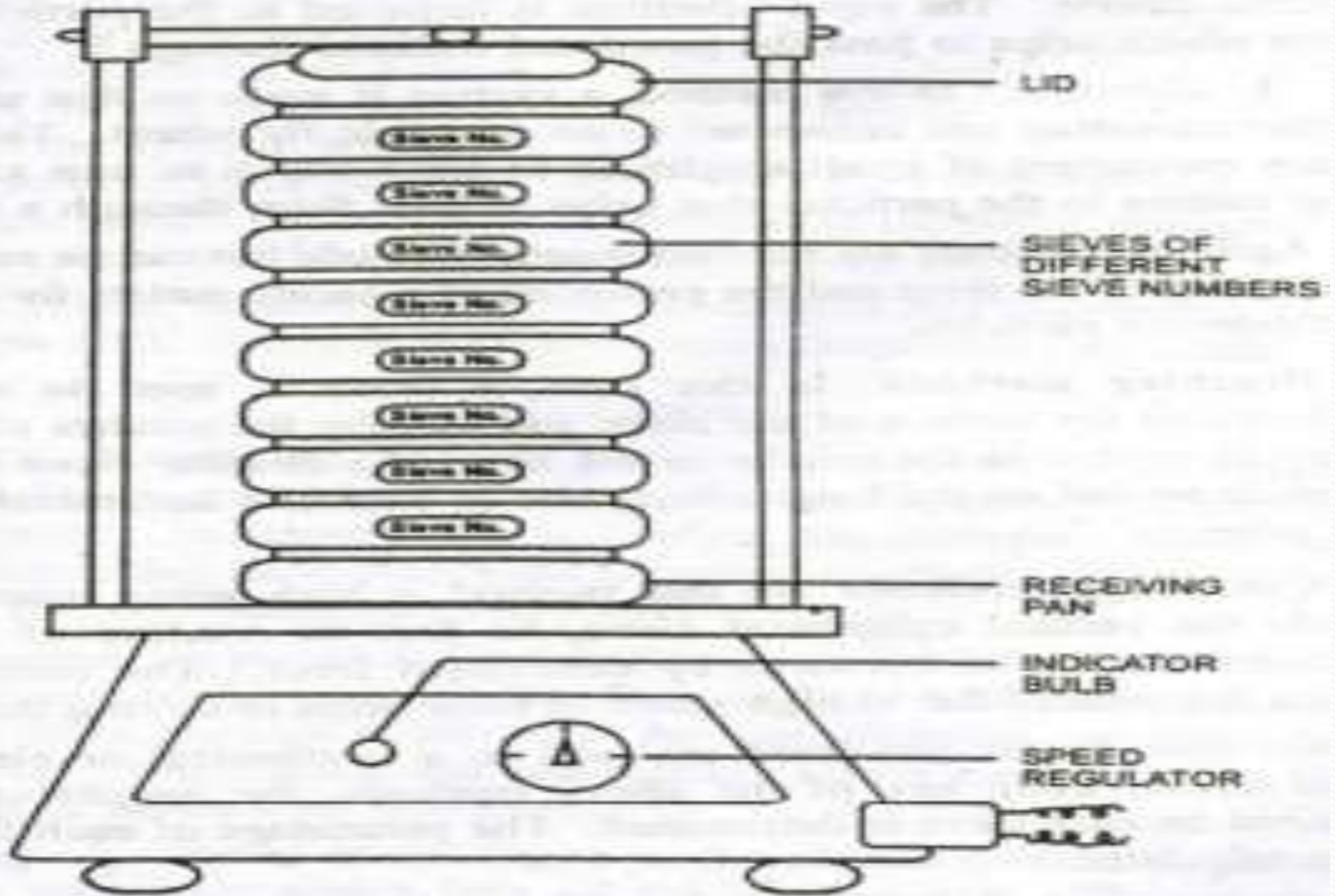


Fig. 6-1 Electromagnetic laboratory sieving machine



**The working of mechanical sieving devices are based on any of the following methods.**

**1. Agitation 2. Brushing 3. Centrifugal**

**Agitation methods** Sieves may be agitated in a number of different ways, such as:

- 1. Oscillation** : This sieve is mounted in a frame that oscillates back and forth. It is a simple method but the material may roll on the surface of the sieve.
- 2. Vibration** : The sieve is vibrated at high speed by means of an electric device. The rapid vibration is imparted to the particles on the sieve which helps to pass the powdered material through it.
- 3. Gyration** : In this method, a system is made so that sieve is on rubber mounting and connected to an eccentric fly wheel. This gives a rotary movement of small amplitude to sieve which in turn gives spinning motion to the particles that helps to pass them through a sieve. Agitation methods are not continuous methods' but can be made so by inclination of the sieve and the provision of separate outlets for undersize and oversize particles.

## Brushing methods

In this case, a brush is used to move the particles on the surface of the sieve and to keep the meshes clear. The brush is rotated in the middle in the case of a circular sieve but spiral brush is rotated on the longitudinal axis in case Of a horizontal cylindrical sieve.

## Centrifugal methods

- In this method, a high speed rotor is fixed inside the vertical cylindrical sieve, so that on rotation of rotor the particles are thrown outwards by centrifugal force. The current of air which is produced due to high speed of rotor helps in sieving the powder.
- On shaking the powdered material in a mechanical or electromagnetic device using any of the above methods, the weight of powder retained on each sieve is determined. The percentage of each fraction is then calculated.
- Sieving method is a rapid process and it requires very little skill. The equipment used for sieving is not expensive.