POWDER MIXER

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CONTENTS

- Introduction
- Mixing
- Objectives of mixing
- Mixing mechanism
- Factors affecting perfect mixing of powders
- Different types of mixers & their use
- Conclusion
- References

INTRODUCTION

- It is an instrument used to mix the powders.
- Mixing is one of the common pharmaceutical operation & is used in the preparation of many types of formulation such as, tablets, capsules, & compound powders.

Mixing

- Mixing is the most widely used operation in which two or more than two substances are combined together.
- Perfect mixing is that in which each particle of one material lies as nearly adjacent as possible to a particle of the other material.
- Mixing is depends on the purpose of the product & the objective of mixing.

Objectives of Mixing

- Simple physical mixing of materials to form a uniform mixture.
- To promote the chemical reaction to get uniform products.
- Dispersion of solid in liquid to form suspension or paste.
- Dispersion of two immiscible liquids to form an emulsion.

Mixing Mechanism

- The solid mixing takes place by a combination of one or more mechanisms given below-

1) **Convective Mixing**: Bulk movement of groups of particles from one part of powder bed to another. It occurs by an inversion of the powder bed by means of blades & paddles.

2) **Shear Mixing:** When shear forces occur it reduces the scale of segregation by thinning of dissimilar layers of a solid material.

Contd…

3) Diffusion Mixing: It occurs when random motion of particles within a powder bed causes them to change position relative to one another.

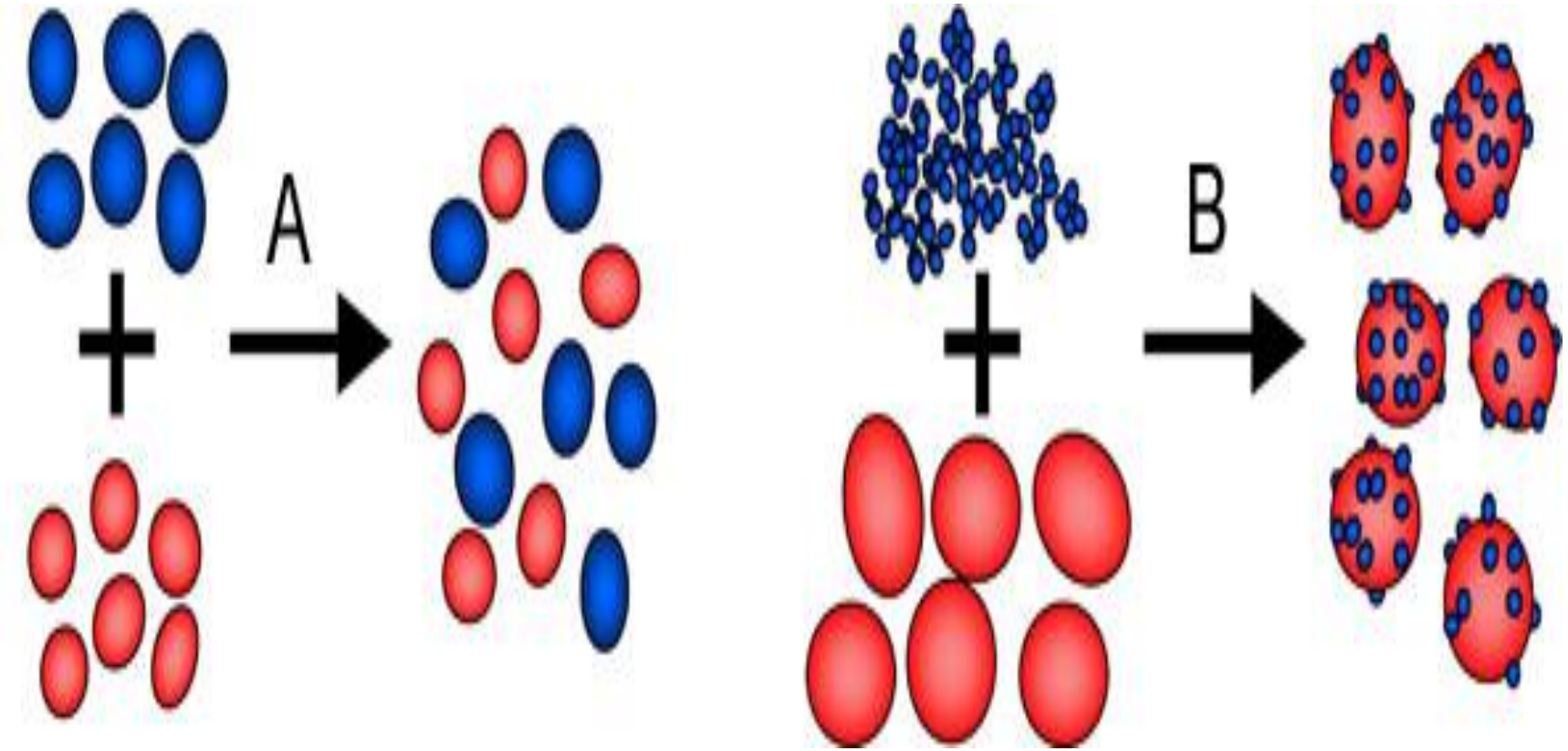
Factors affecting perfect Mixing of Powders

- **Particle size:** Variation of particle size can lead to separation, because small particles move downward through the space between the bigger particles.
- **Particle shape:** The ideal particle shape is Spherical for uniform mixing.
- **Particle attraction:** Some particles exert attractive forces due to electrostatic charges on them. This can lead to separation.

Contd…

- **Material density:** It is difficult to mix two powders having different density. This is due to dense material always move downwards & settles down at the bottom.
- **Proportions of materials:** The best result can be achieved if two powders are mixed in equal proportions by weight or by volume. In case there is large difference in the proportions of two powders to be mixed the mixing of powders is always done in the ascending order of their weights.

Particles Mixing



Mixing

- Mixing of Powders/Solids
- Mixing of Liquids
- Mixing of Semi-solids

- **Powders:- Tumbler mixer**
  Double cone mixer
  Agitated powder mixer
  Air mixer

- Liquids:- Propeller mixer
  Turbine mixer
  Paddle mixer

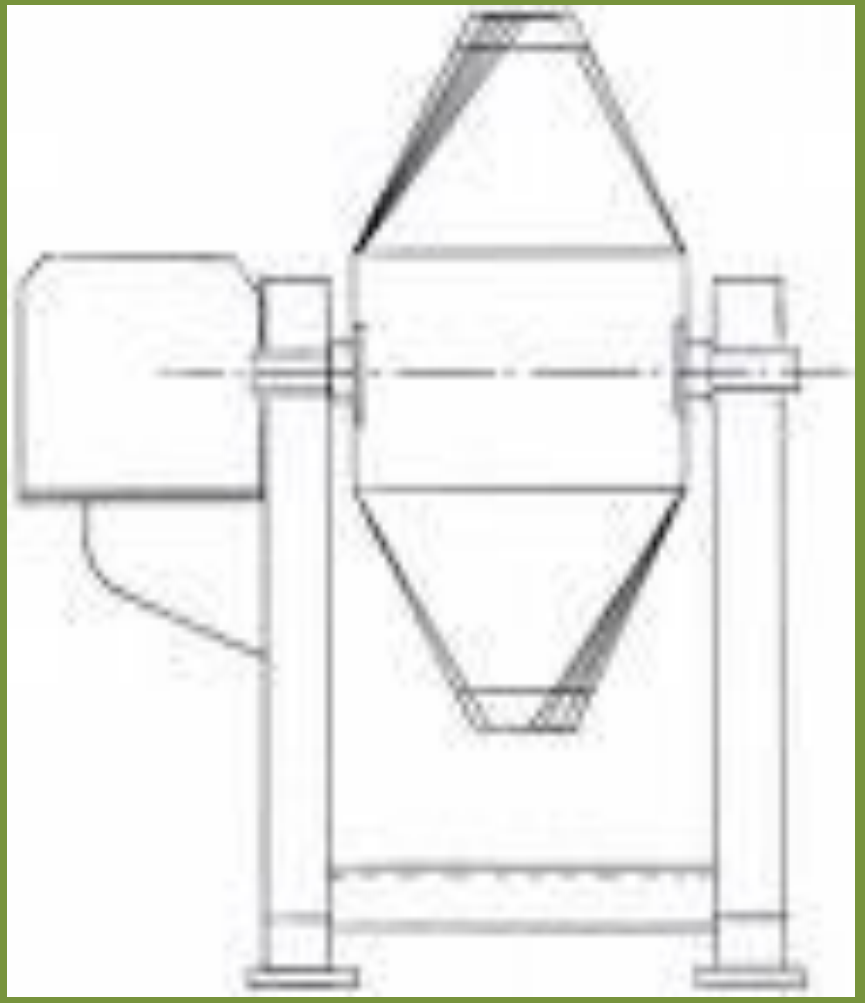
- Semi-solid:- Triple roller mill
  Agitator mixer
  Planetary mixer

Tumbler Mixer

- It consists of a metallic vessel in which powders are mixed by slow rotation, either manually or with the help of an electric motor.
- Due to rotation the ingredients come over one another.
- The tumbler mixers are generally made up of stainless steel and are of various designs, such as cubical, V-shaped, Y-shaped, & cylindrical etc.
- These are rotated at a low speed by using an electric motor of suitable horse power.

Tumbler Mixer

Double-Cone Mixer



Double Cone blender

Contd…

- It is made up of stainless steel, & is available in different capacity ranging from 5 Kg to 200 Kg or even more.
- The efficiency of the blender depends on the speed of rotation.
- The rate of rotation should be optimum which depends on the size & shape of tumbler as well as nature of material to be mixed
- The common range is 30-100 r.p.m.

Contd…

- The material is to be blended is loaded approximately 50 to 60% of the total capacity of the blender.
- As the blender rotates the material undergoes tumbling motion and mixes the material thoroughly.

Use:-

- Mixing powders of different densities.
- Used mainly for small quantity of powders.

Agitated Powder Mixer

Contd…

- It consists of a stationary vessel in which an arm rotates & transmits shearing action to the particles.
- The end-to-end movement is required for general mixing which can be achieved by fitting helical blades to the agitator.

Uses:-

- Mixing free flowing powdered materials having uniform particle size and density.

Air Mixer

Contd…

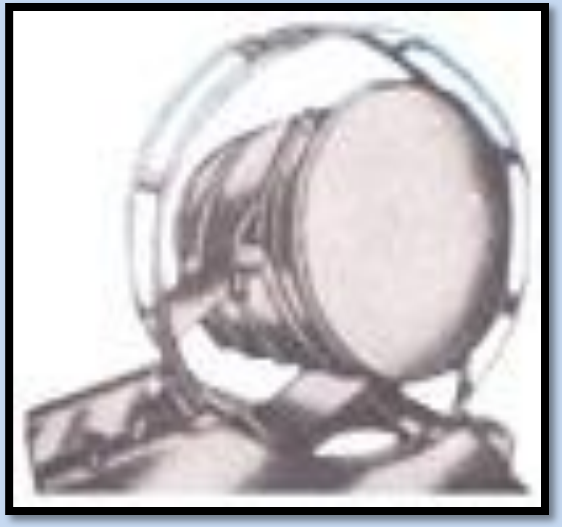
- The air movement can be used for mixing of powders.
- The powders to be mixed are taken in a vertical cylindrical vessel & air is admitted at its base.
- This gives a spiral movement to the powder.
- The air should be admitted at short intervals & not continuously.
- A typical method is to use eight air blasts of two seconds duration with one second interval.
- Thus 24 seconds are required for proper mixing.

- **Different types of Powder Mixer**

Drum Mixer

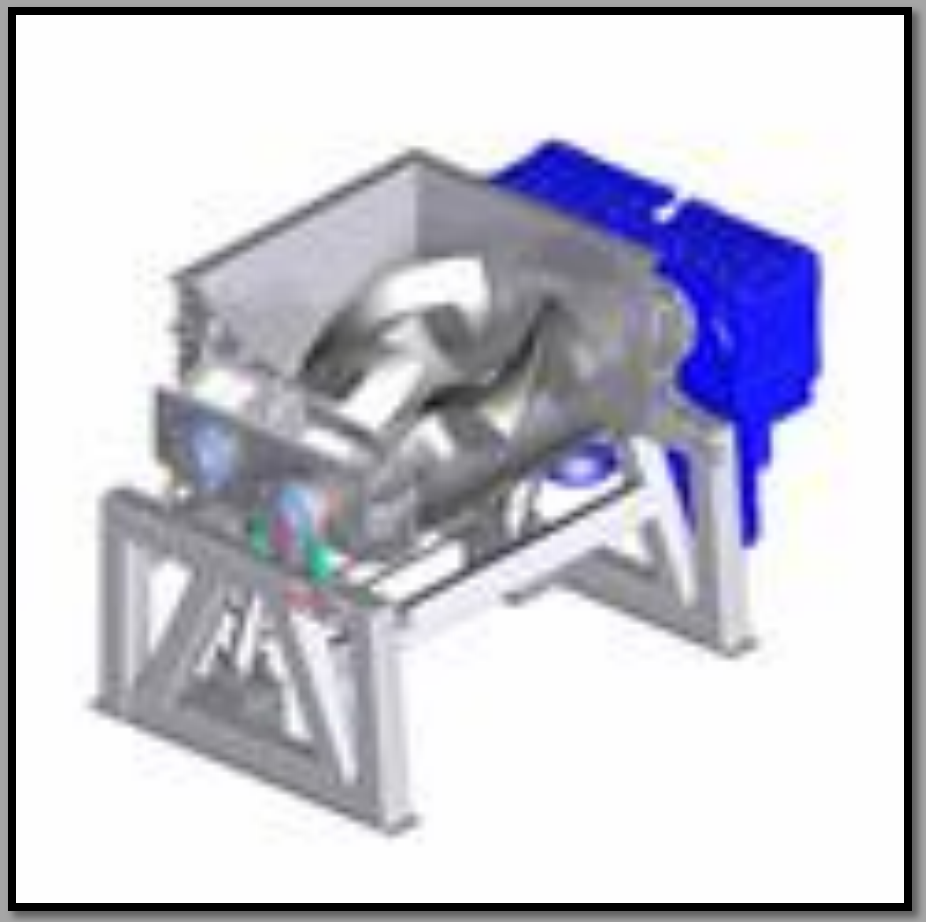
EYH Drum Mixer

Drum Mixer



Rotary Drum Mixer

Z-Blade mixer



Double cone blender

Conclusion

- For small scale we are using mortar & pestle for mixing.
- For large scale/pharmaceutics we can go for these different varieties of mixers.
- These are easy to perform.
- By using these instruments we can save time.
- Work will become faster.

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