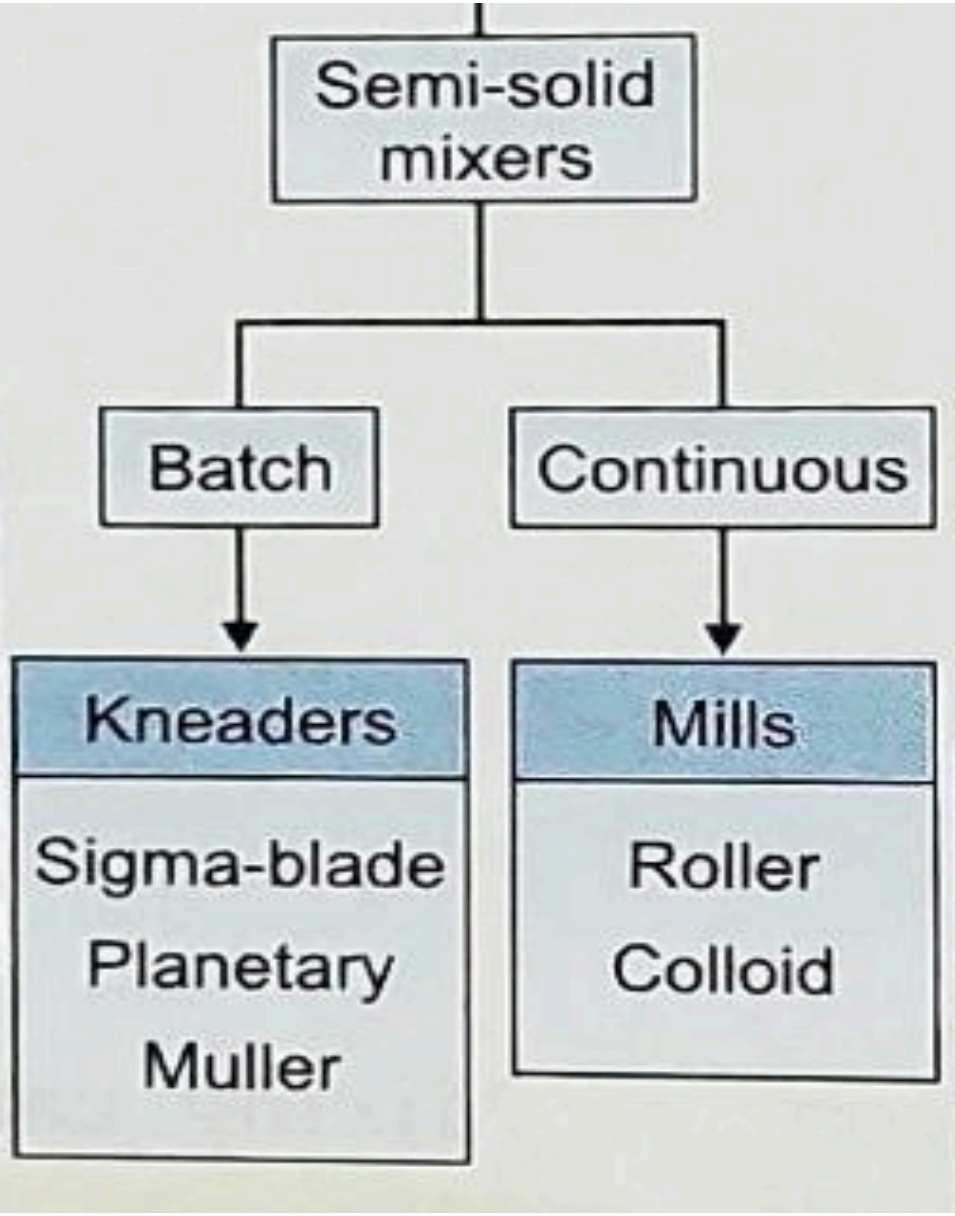
Semisolid Mixing

Semisolid Mixers

- **Semisolids include** ointments, paste, creams, gels, etc.

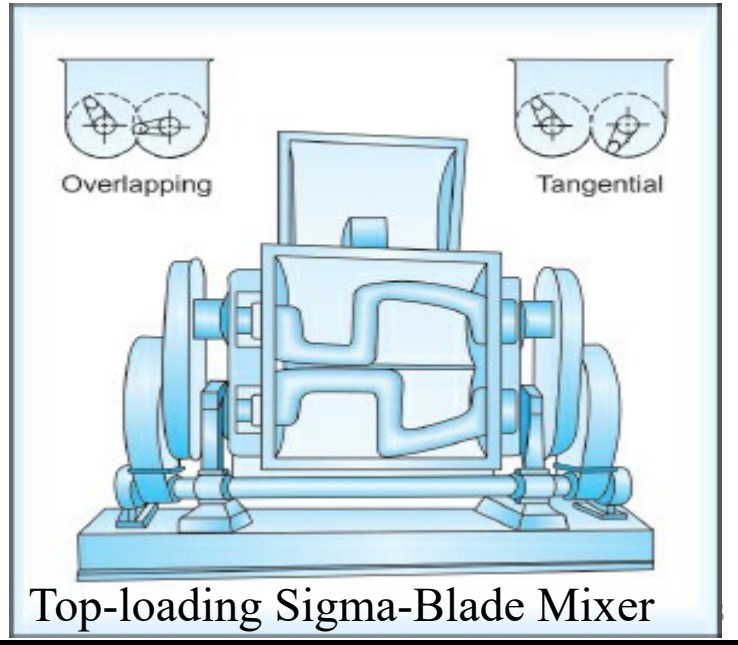


Semisolid Batch Mixers: 1- Kneaders

A. **Sigma-blade Mixer**: contains counter-rotating blades or heavy arms that work the plastic mass.

- The blades rotate tangentially in a 2:1 speed ratio (one moves faster than the other).
- **Mixing action is due to**:

1. The **shape** and **difference in rotational** speed of the blades facilitate lateral pulling of the material and impart kneading and rolling action on the material.
2. Shear forces are also generated by the **high viscosity** of the mass and are thus effective in **de-aggregation** as well as **distribution** of solids in the fluid vehicle.

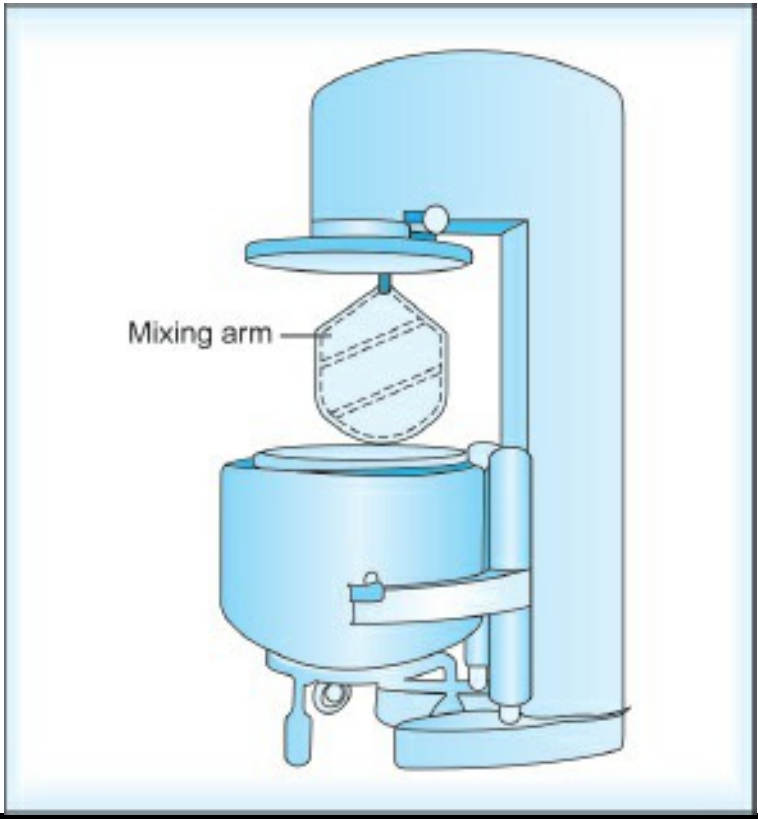


Top-loading Sigma-Blade Mixer

Semisolid Batch Mixers: Kneaders

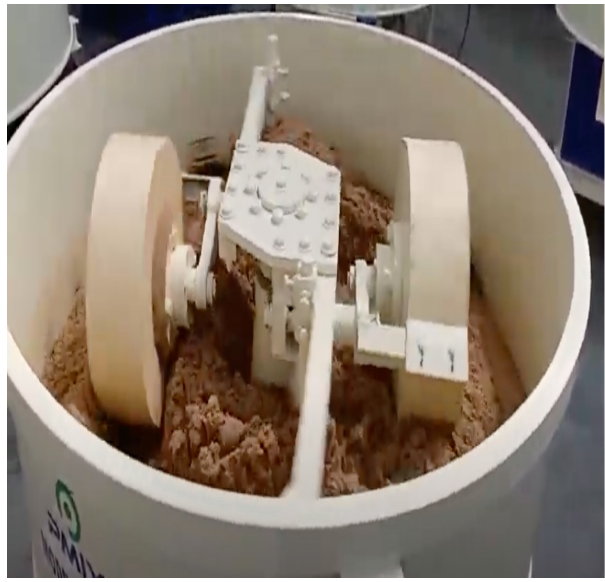
B. Planetary Mixer: Provided **planetary mixing action** where the mixing arm rotates around itself and around the circumference of the container.

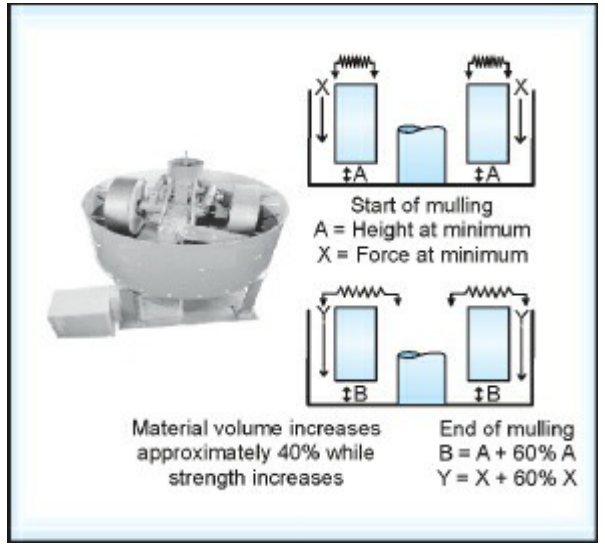
- This **1-** two-rotation movement and **2-** offset position of the mixing arm reduces or prevents the formation of **dead zones of mixing and avoids vortex formation.**



Semisolid Batch Mixer: Kneaders. C- Mulling Mixers

- **Action**: Mulling mixers provide forces that incorporate 1 kneading, 2- shearing, 3- smearing, and 4-blending of materials for total uniform consistency.
  - This process **produces just enough pressure** to move, intermingle, and push particles into place **without** crushing, grinding, or distorting the ingredients.
- **Uses:** Mulling mixers are **efficient in the de-aggregation** of solids ➔ These devices are suitable for mixing **previously mixed material** of uniform composition but **containing aggregates** of solid particles.
  - **But** are typically **inefficient** in distributing the particles uniformly throughout the entire mass.
- **Note**: In the event of segregation during mulling, a final **remixing** may be necessary.



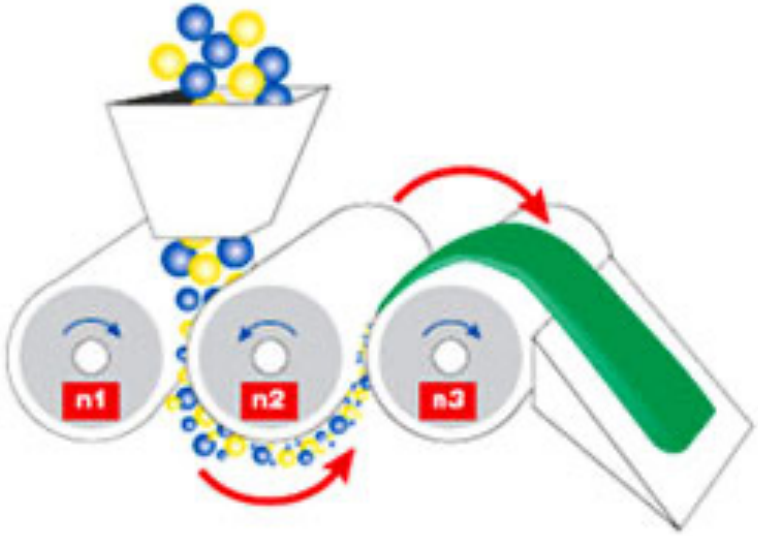


https://youtu.be/KLgq8rR34FE

Semisolid Continuous Mixer: 2- Mills

A. Roller Mills: Consists of one or more rollers.

- Usually, a **triple roller** system is preferred.
- The roller is made of **hard abrasion resistance** materials and arranged to come into close proximity to each other and rotated at different rates.
- **Action:** Depending on the gap, the material that comes between the rollers is **crushed**, and also **sheared** by the difference in rates of movement of the two surfaces.
- This type of mixer is applied for **heavy work** like working with **pastes.** (example on next slide).



Semisolid Continuous Mixer: 2- Mills

- In extreme cases of solid-liquid mixing, a small volume of liquid is to be mixed with a large quantity of solids.
- This process is essentially one of coating the solid particles with liquid and subsequent transfer of liquid from one particle to another.
- In this type of mixing, **the liquid is added slowly** to reduce the tendency of the particles to form a lump.
- However, the process is not for fluids mixing, but for solids mixing. When the particles tend to stick together because of the surface tension of the coating liquid, ➔
- The equipment used is the same as that for **pastes (roller mills)**.
- **But**: If the solids remain essentially free-flowing, the equipment is the same as that used for solids mixing.