

## DEMONSTRATION OF COLLOID MILL, PLANETARY MIXER, FLUIDIZED BED DRYER, FREEZE DRYER

### AIM:

Demonstrating Colloid Mill, Planetary Mixer, Fluidized Bed Dryer, Freeze Dryer.

### 1) COLLOID MILL:

- ❖ The colloid mill used to reduce the size of the suspended droplets
- ❖ The material is feed in through the inlet hopper and placed into the mill
- ❖ It is then move through the narrow gap between the rotor and stator to reduce the particle size
- ❖ Then final product is removed through the outlet

## Colloidal mill

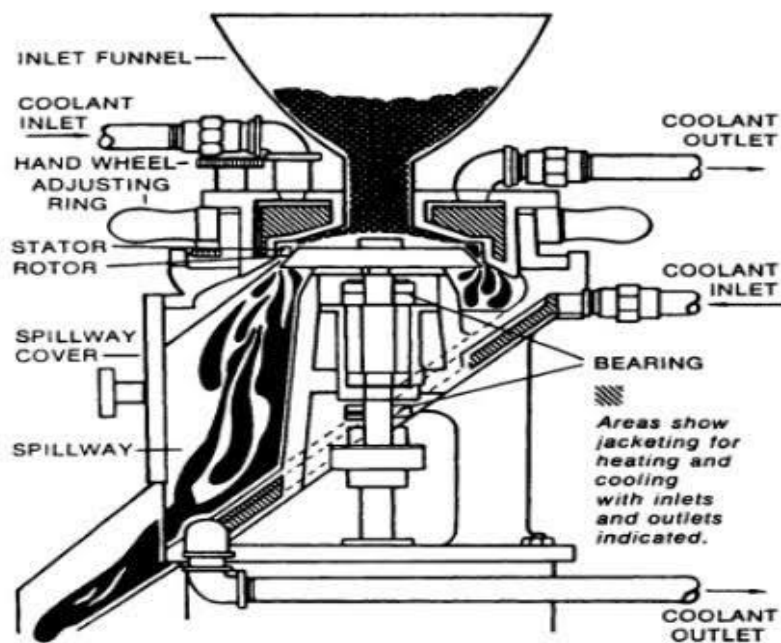
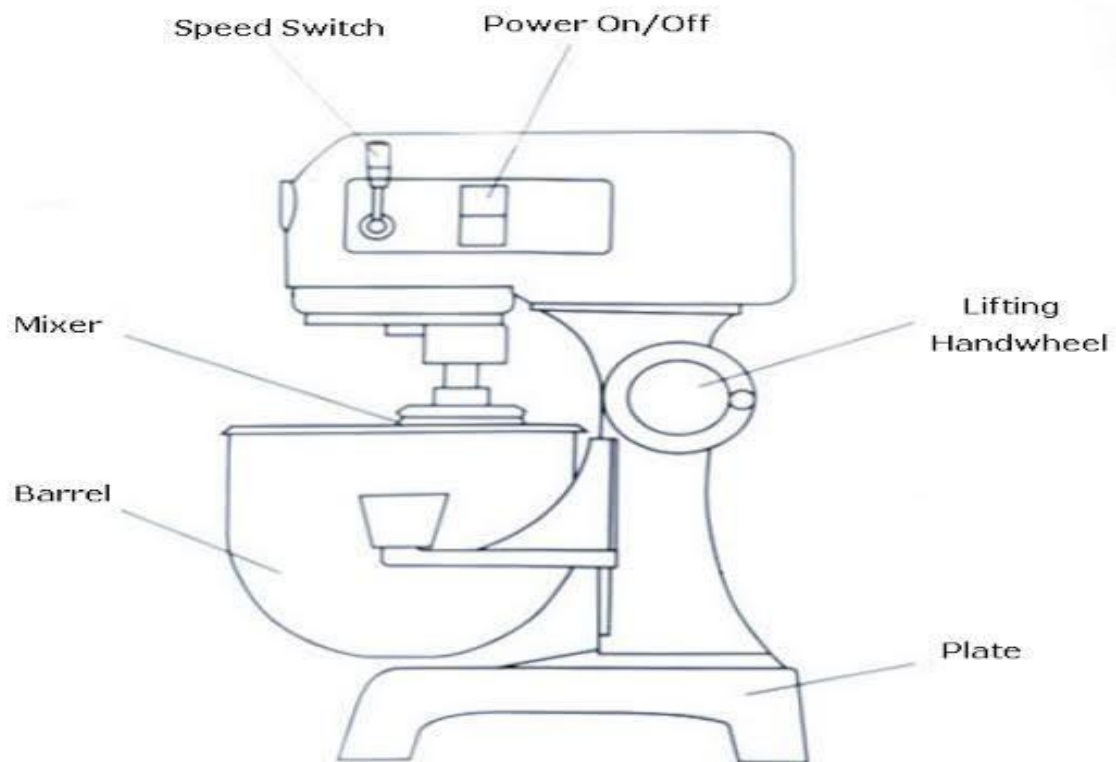


Fig. 32 Cross-section of colloid mill. (From Ref. 29.)



## 2) PLANETARY MIXER:

- The material to be mixed is loaded into mixing bowl or shell
- The blades rotate on their own axis when they orbit the mixing bowl on a common axis. Therefore there is no dead spot in the mixing and high shear is applied for mixing
- After mixing, the material is discharged through a bottom valve or by manual scooping of the material from the bowl



**Planetary Mixer**

### 3) FLUIDIZED BED DRYER:

- The wet granules to be dried are placed in a detachable bowl, the bowl is inserted in the dryer
- Fresh air can pass through a pre filter, which is then heated when passing through a heat exchanger
- Hot air flows through the bottom of the bowl at the same times, the fan starts to rotate the air speed increases gradually
- After a specific time a pressure point is reached in which the friction drag on the particles is equal to the force of gravity. The granules rise in the container. This condition is said to be fluidized state
- The gas surrounds each granule to dry them completely the air comes out of the dryer passing through the filters in the bag
- The entrained particles remain adhered to the interior of the surface of the bags. Periodically, the bags are shaken to remove entrained particles
- The materials are left in the dryer to reach room temperature
- The bowl is removed, the final product is free flowing

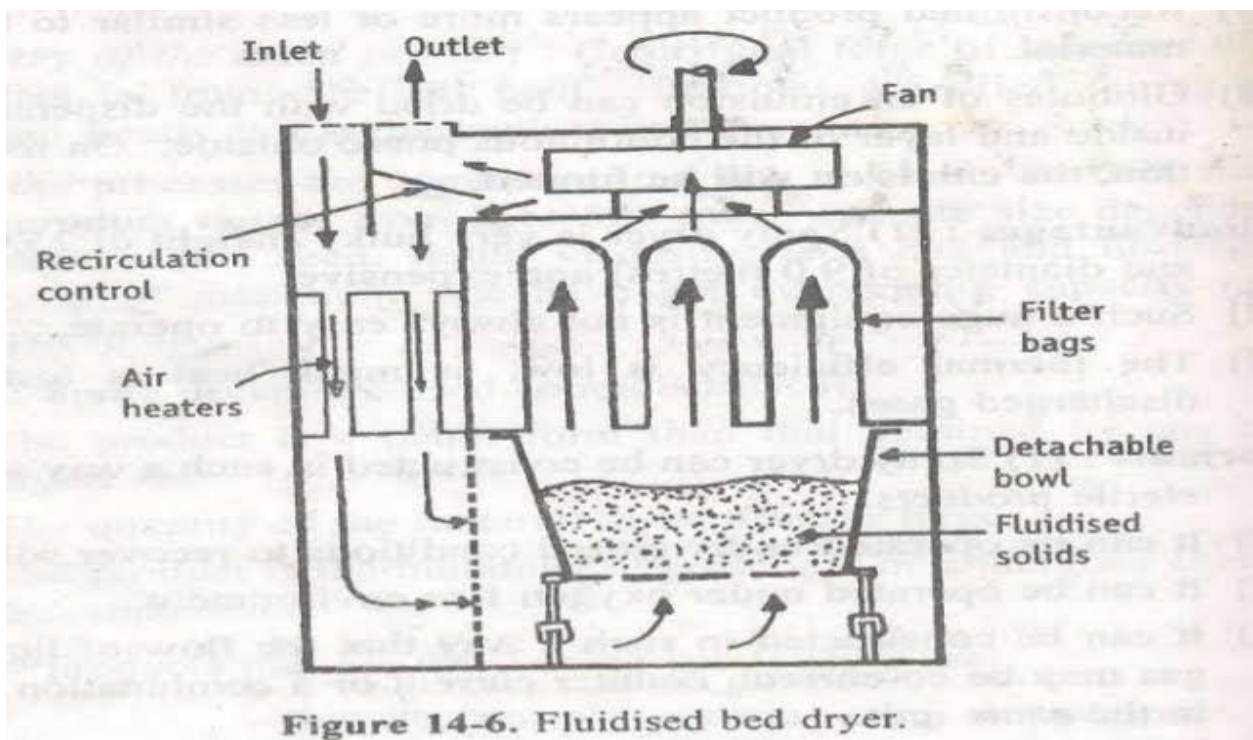


Figure 14-6. Fluidised bed dryer.

#### 4) FREEZE DRYER:

- ❖ The material is pre-treated before freezing pre-treatment methods include freezing concentration, solution phase concentration and formulation to preserve the appearance of the product. Formulation to stabilize reactive products. Formulation to increase the surface area and decreasing high vapour pressure solvent
- ❖ The product should be frozen at a temperature low enough to solidify completely. The products are frozen in two ways, most of the products that are lyophilized consist mainly of water. It is very important in lyophilisation to pre-freeze the product below the eutectic temperature before beginning the lyophilisation process
- ❖ After the pre-freezing the product conditions must be established in which the ice can be removed from the frozen product through sublimation resulting in a dry, structurally intact product
- ❖ After primary freeze drying is completely and all the ice has sublimed, bound moisture is still present in the product. The product appears dry, but the residual moisture content may be as high as 7-8% continued drying is necessary at warmer temperature to reduce the residual moisture content to optimum value. This process is called “isothermal desorption” secondary drying is usually carried out for approximately 1/3 or 1/2 the time required for primary drying
- ❖ After vacuum is replaced by inert gas, bottle and vials are closed

# 11. Schematic diagram of freeze drier

