

Spray- Drying Technique of Milk Drying

LPT-610

UNIT - I

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Atomization

Principles

To reduce the size of milk particles to a range of 50-150 microns in diameters so that the so that the mass : surface area of the droplet increases. This would lead to faster and efficient heat and moisture exchange.

Purpose

To make drying more efficient and to yield product which can be instantly be transformed from a dried solid material to a liquid in its original form

Principle

(Spray drying technique)

Atomizing (50-150 microns) the pre-heated and concentrated milk to form a spray of very minute droplets, like a fog or mist. These droplets are then directed into a very large, suitably designed drying chamber where they come in contact with currents of hot air. Due to high temperature and large surface area the milk particles evaporate their moisture almost instantaneously and transform into a fine powder. This is then removed continuously.

Types

Based on method of atomisation

- Hydraulic Pressure Jet or Pressure Spray Nozzle
- Compressed Air Spray or Pneumatic Spray
- Centrifugal Spinning Disc

Hydraulic Pressure Jet or Pressure Spray Nozzle

- Cone shaped spray nozzle a.k.a “Swirl Nozzle” is used.
- Pressure of 1500-5000 psi is created.
- With the help of 3-5 piston homogeniser pump, milk is sprayed out of the nozzle.
- A swirl nozzle, widens the angle of milk fog formation and intensifies the atomisation action.
- Milk is sprayed through a small nozzle under high pressure which causes formation of fine particles or mist (atomization), which when dried turns into fine powder.

Compressed Air Spray or Pneumatic Spray

Heated compressed air is streamed with high velocity. This stream of hot air strikes the stream of pre-heated milk at right angles, which causes splitting of the stream and atomization of the milk particles. These particles when come in contact with dry hot air dry up to form dried milk particles.

Centrifugal Spinning Disc

- It consists of a hemi-spherically shaped liquid chamber in which the product (concentrated pre-heated milk) moves.
- Radial vaned discs are used.
- Radial discs of small diameter revolve at 50,000 rpm speed whereas radial discs of larger diameter revolve at lower speed I.e. 3500 rpm.

Viscous (concentrated) pre-heated milk falls from the liquid chamber onto the spinning radial discs. The vanes present on the disc spread the milk and atomise it. These atomised droplets when come in contact with hot air dry up into dried milk powder.

Radial Centrifugal Disc



Centrifugal Spinning Disc

Advantages over other methods

1. Absence of small orifices that are subjected to clogging.
2. Permits spray drying of highly concentrated milk, milks containing as high as 50% solids.
3. No pump pressure is required.
4. Capable of continuous operation under prolonged periods without special attention.
5. Free from abrasive action

Centrifugal Spinning Disc

Disadvantages over other methods

- Requires upkeep of high speed bearings hence maintenance cost might be a burden.

Advantages

(of spray drying system over drum drying system)

- Yields milk powder which is markedly superior in appearance, flavour and solubility.
- Product of higher economic value.
- Most economical when large quantities of milk are handled

Disadvantages

(of spray drying system over drum drying system)

- Technique more sophisticated in nature.
- Plant is complicated .
- Involves large capital investment in plant and buildings.

Thank You

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