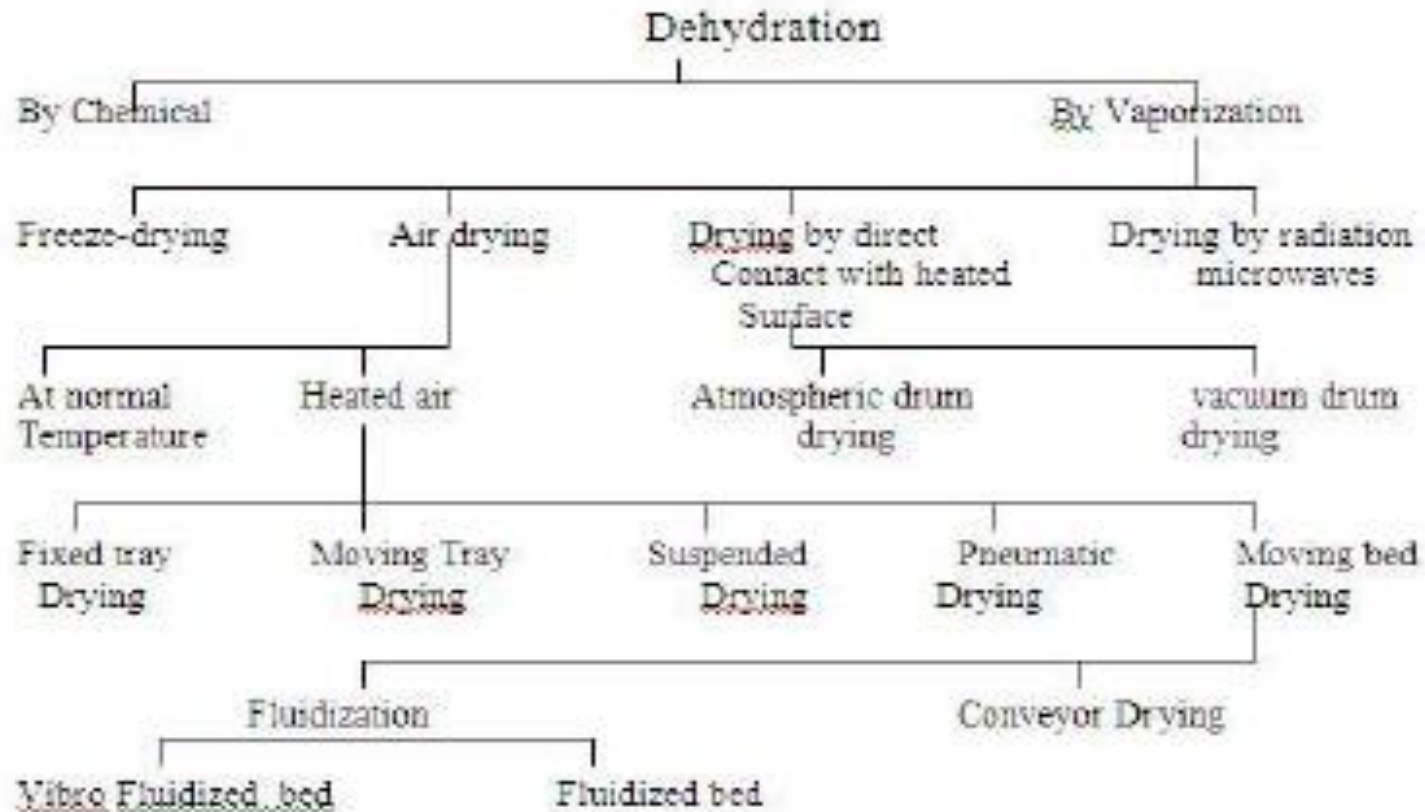


Lesson 12 Classification of Dryers, Spray dryers, Drum dryers and problems on Dryers

12.1. CLASSIFICATION OF DEHYDRATION SYSTEMS



Dehydration systems can be classified as per the scale of operation

- Domestic Open sun drying
- Solar drying
- Small scale Roller drying
- Tunnel drying
- Cabinet/ Tray
- Trough drying
- Microwave drying
- Dielectric
- Medium and Large scale Spray
- Fluidized bed
- Freeze
- Puff
- Vacuum
- Bin
- Pneumatic
- Rotary
- Tower

Drum Drying

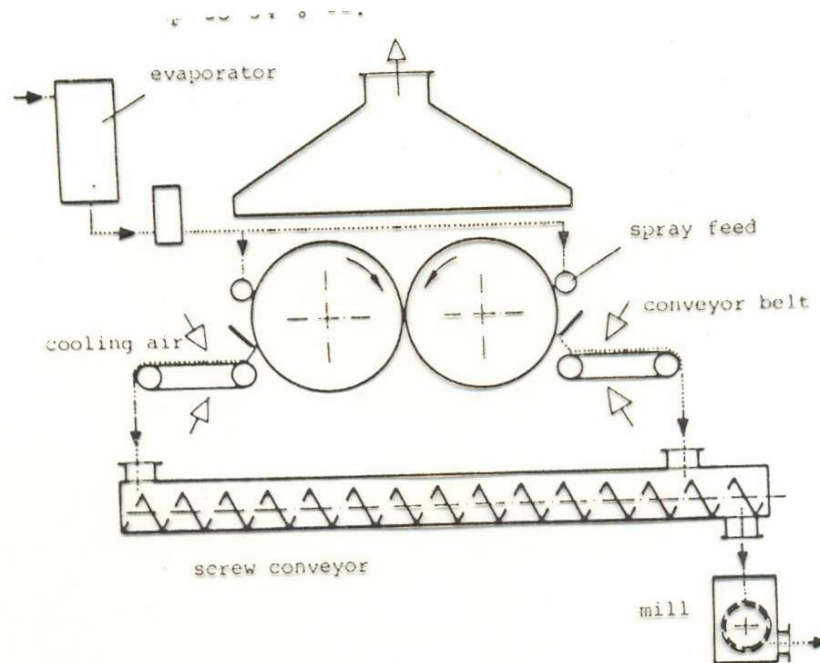
- The drum dryer is an indirect type dryer in which the milk to be dried is maintained in a thin film on a rotating steam heated drum.
- The process is also known as roller drying or film drying.
- Drum drying requires less space and is more economical than spray dryers for small volumes.
- The ratio of steam consumption to water evaporation is from 1.2 to 1.6:1.
- The major disadvantages are that the product may have a scorched flavour, and solubility is much lower (85%) because of protein denaturation.

Classification of Drum Dryers

- The drum dryers may be classified according to:
 1. Number of drums (a) single drum, (b) double drum, or (c) twin drum
 2. Pressure surrounding the product (a) atmospheric, and (b) vacuum
 3. Feeding arrangement: (a) nip feed, (b) splash feed, (c) dip feed or (d) roller feed
 4. Material of construction: (a) alloy steel, (b) stainless steel, or (c) chrome, or nickel plate steel

Construction

- The double drum atmospheric dryer is most commonly used in the dairy industry
- Liquid is fed at about 70 °C from a trough or perforated pipe into a pool in the space above and between the two rolls.
- The inside of drum is heated with steam at 3-6 kg/cm²
- Drum temperatures of below 130 °C. The spacing between drums is about 0.5 to 1.0 mm.
- The drums used are 60 to 120 cm in diameter, and upto 360 cm in length
- The speed of the drums is adjustable from 6 to 24 rpm.
- The time that the solid is in contact with metal is 3 s or less. The product is removed after 3/4 to 7/8 of a revolution of the drum has taken place.



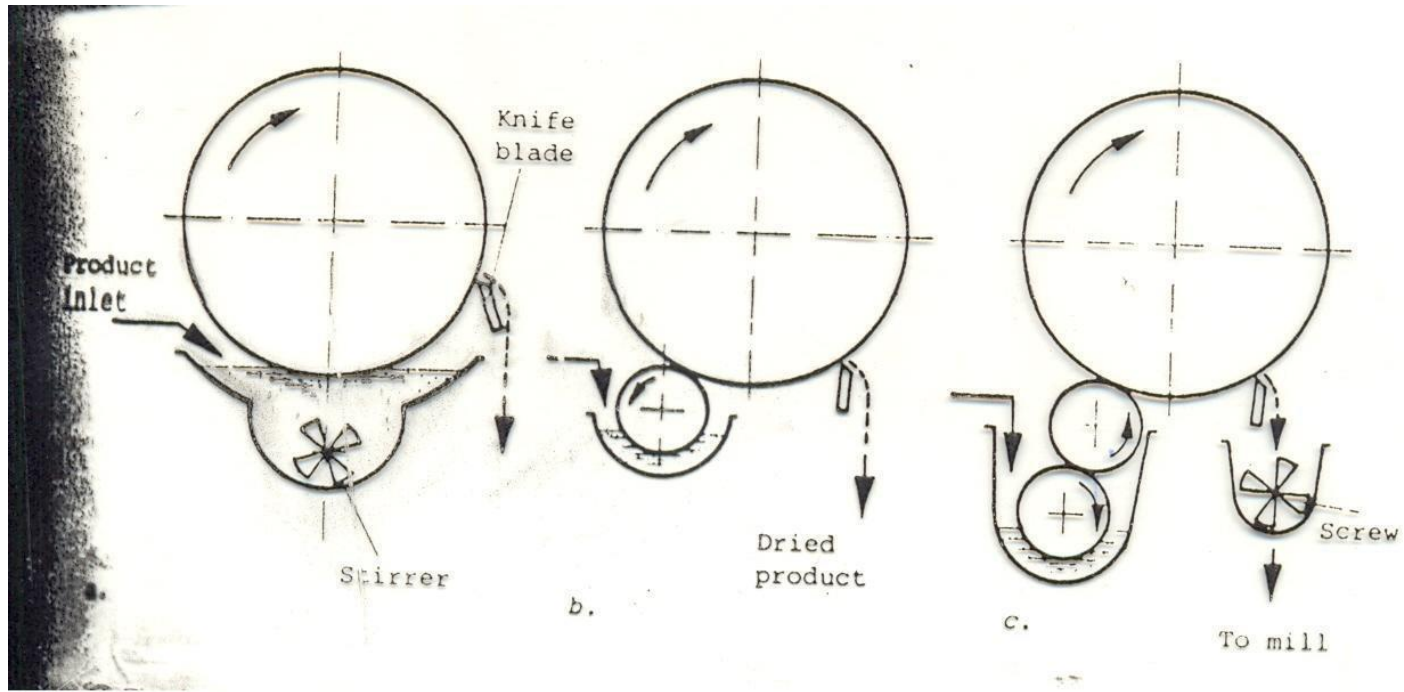


Fig. 12.2 Roller dryers with (a) dip feed (b) application by roller and (c) thin layer application with dip feed roller and transfer roller

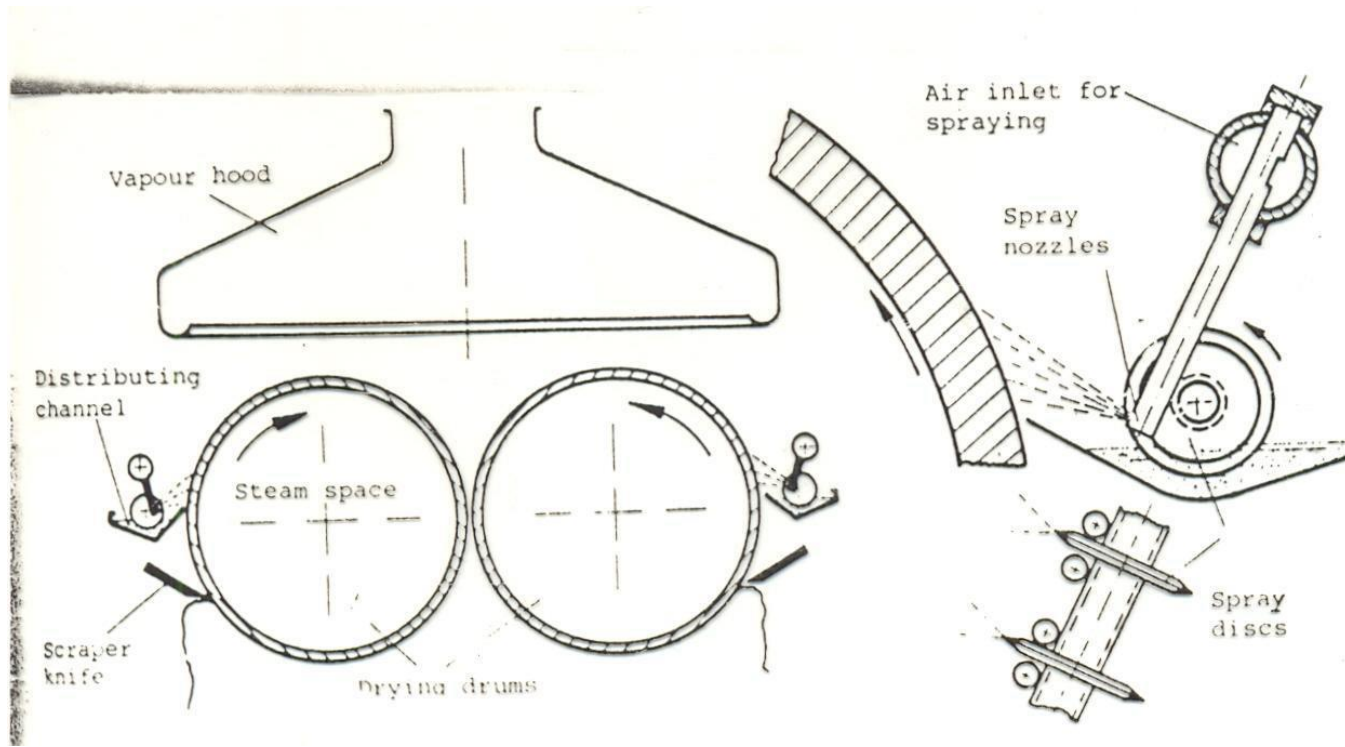


Fig:12.3 Twin roller dryer with spray film feed

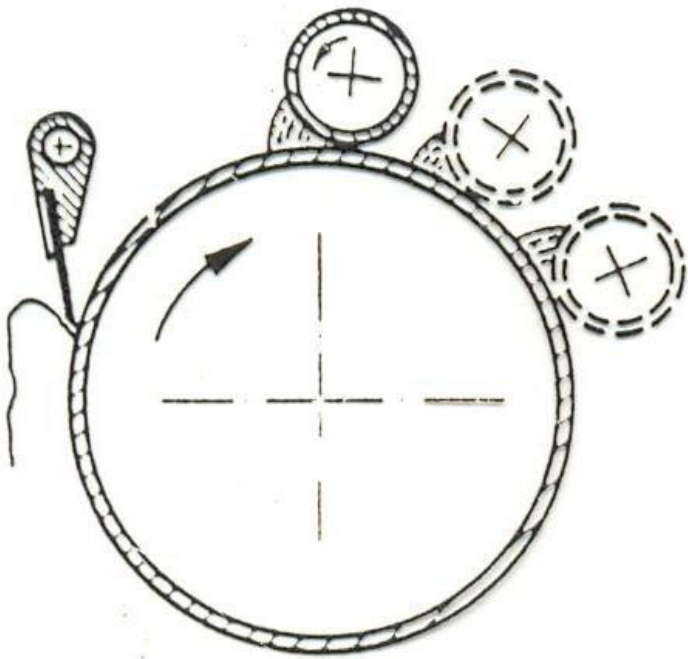


Fig. 12.4 Single roller dryer with feed rollers fitted on top

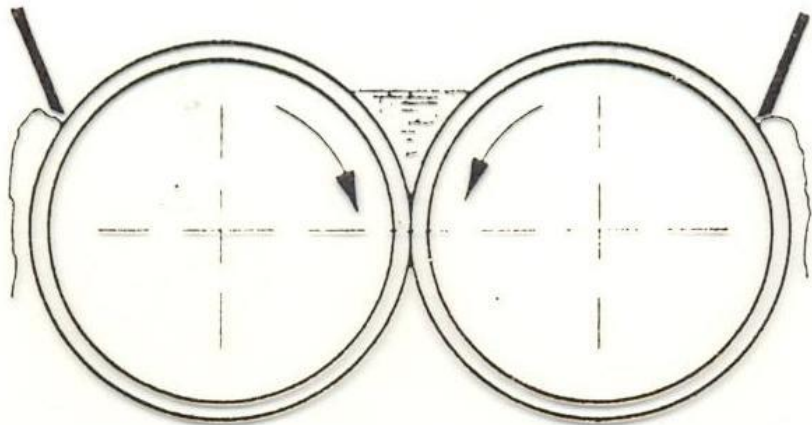


Fig. 12.5 Twin roller dryer with reservoir

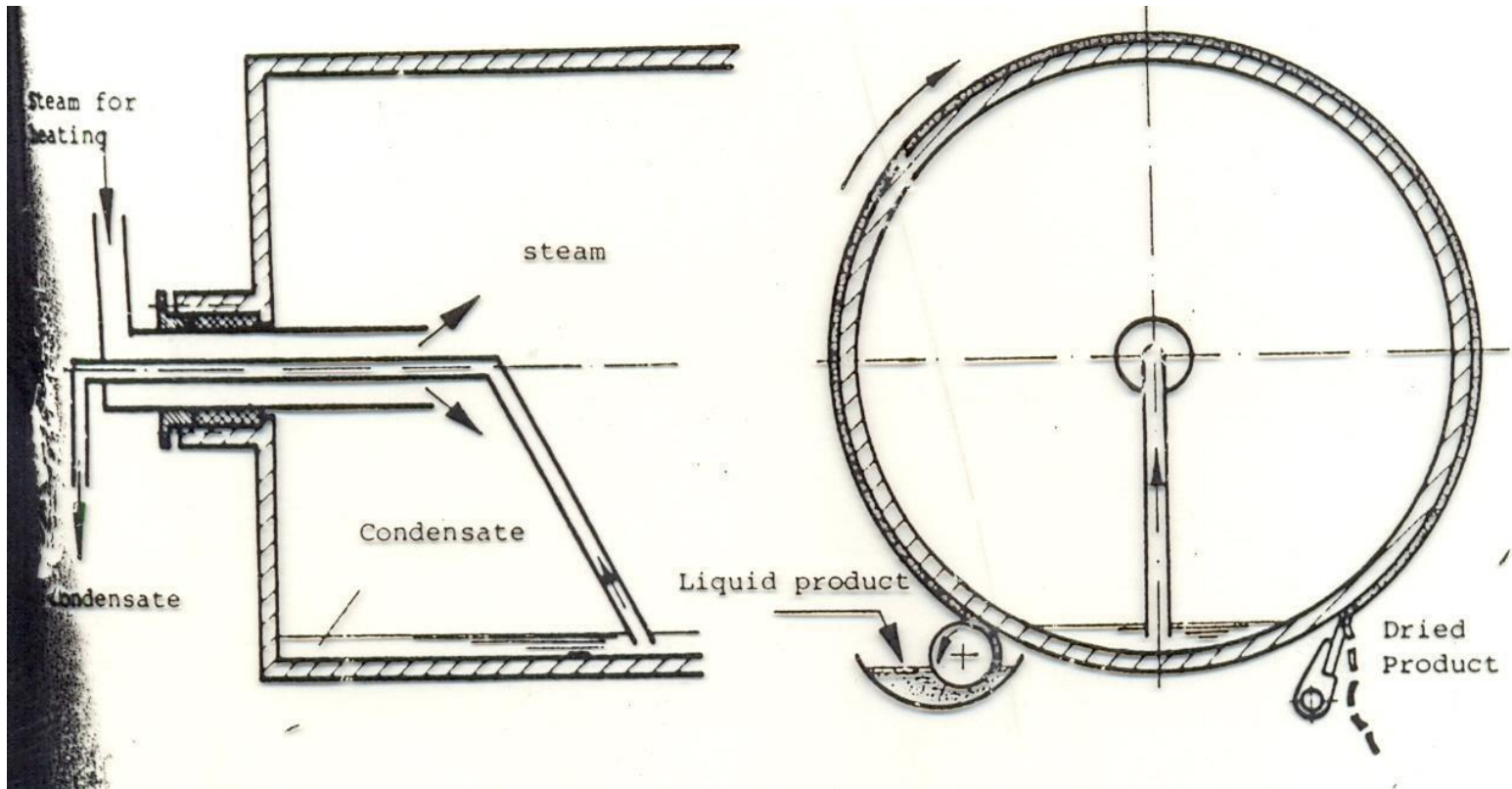


Fig. 12.6 Steam inlet in to drum for heating and the condensate discharge in roller driers

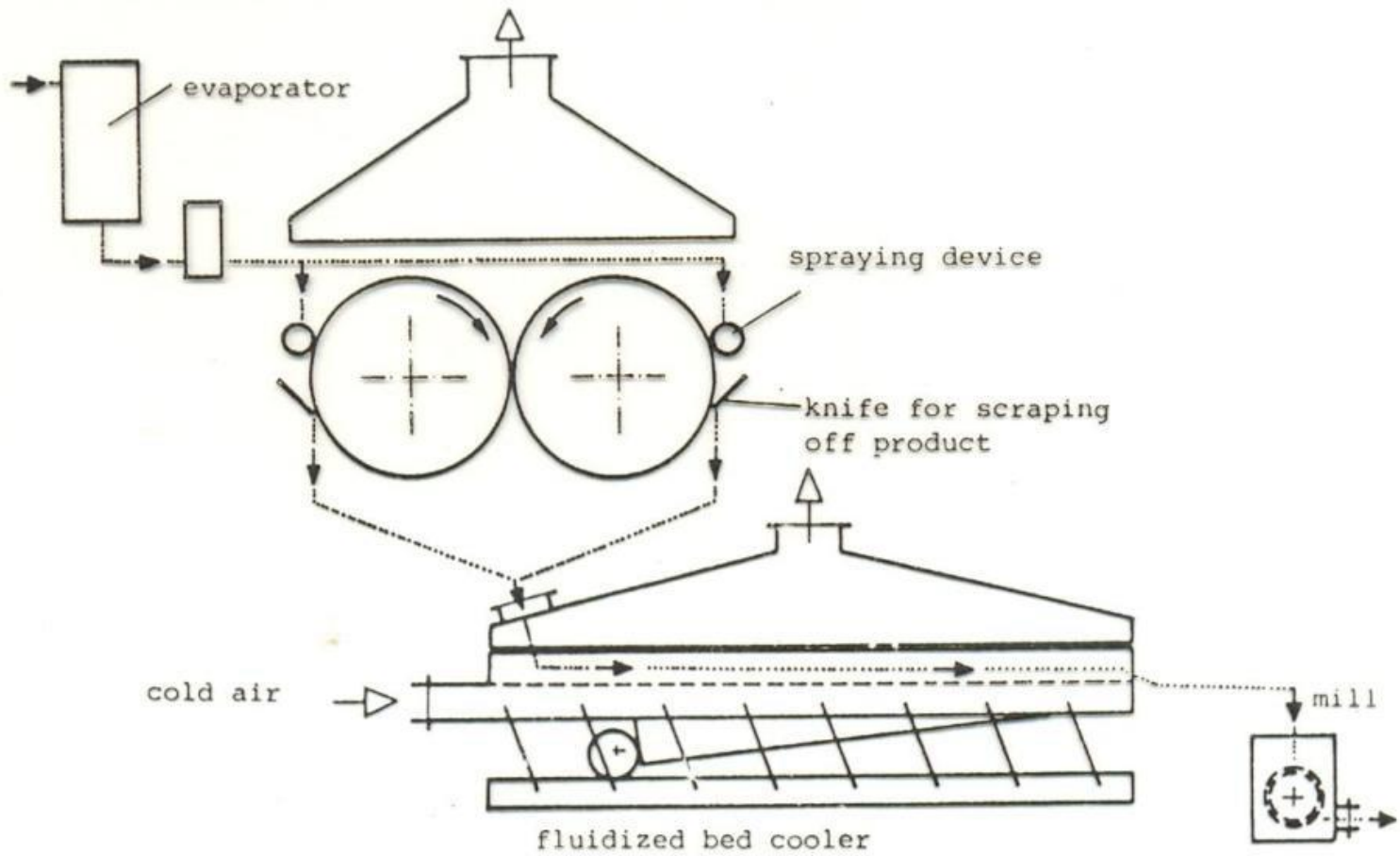


Fig. 12.7 Roller dryer with fluidized bed