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Different Types of Evaporators used in Dairy Industries

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Outline

- Introduction
- Different Types of Evaporators
 - Long Tube Vertical evaporators
 - Plate Evaporators
 - Film Evaporators with mechanically moved parts



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Introduction

Different types of evaporators

- 1) Sources of heat
- 2) Position of tubes for heating
- 3) Method of circulation of product
- 4) Length of tube
- 5) Direction of flow of film of product
- 6) Number of passes
- 7) Shapes of tube assembly for heat exchanger
- 8) Location of steam
- 9) Location of tubes



Long Tube Vertical (Rising and Falling film type) Evaporators

The falling film evaporator is used to reduce the amount of heat treatment and exposure of heat to the product. The tubes are from 4 to 5 cm diameter and up to 600 cm long in the falling film evaporator. The product is sprayed or other wise distributed over the inside of the tubes which are heated with steam. Unless the tubes are fairly heavily loaded there is a risk that some of the tubes may not get their fair share of feed and will overheat or over concentrate the liquid flowing down. The distributor is provided for uniform distribution of feed to each and every tubes of calandria to form thin film over the inner surface of tubes.

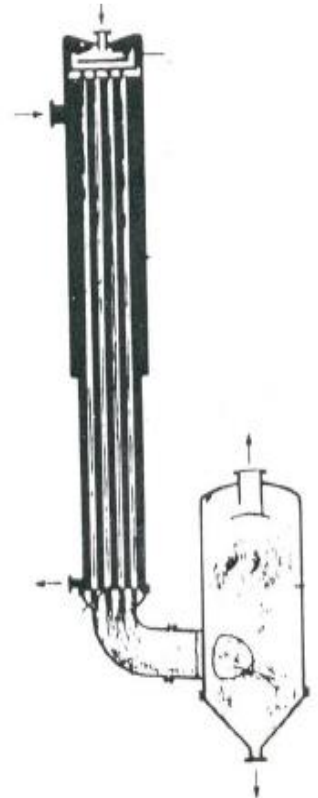




Table-3.1: Difference between rising and falling film evaporators

Rising Film Evaporators	Falling film Evaporators
More residence time	Less residence time
More temperature difference is required between heating medium and feed	Less temperature difference is required between heating medium and feed
Less overall heat transfer coefficient	More overall heat transfer coefficient
There is a static head and hence change in the boiling point due to hydrostatic head in the tube	There is no static head and hence no change in the boiling point due to hydrostatic head in the tube
Higher vacuum is not possible	Higher vacuum is possible
It is not used for heat sensitive products	Used for heat sensitive products as gentle heating
More fouling problem	Less fouling problem



Material of Construction

Evaporator bodies and tubes are fabricated from the materials mostly of stainless steel (AISI- ss - 316) is used when corrosive action is to be prevented.

Design consideration

Evaporator drums invariably operate under vacuum. These are designed for an external pressure of 0.1 N/mm² (100 kPa). The bottom head may be conical in many cases and may be designed for similar pressure rating.

Plate Evaporator

The plate evaporator is characterized by a large heat exchanger surface occupying a relatively small space which need not be very high. Like the plate heat exchanger, it is constructed from profile plates, with the condensing steam used as heating medium and the evaporating product passing between alternate pairs.



Film evaporators with mechanically moved parts (SSHE)

The advantages of this evaporator are:

1. It can handle highly viscous, pulpy and foaming materials.
2. Evaporation rates are high.
3. Fouling problem non-existent.

The disadvantages are:

1. Requires precise alignment because of small blade clearance.
2. Difficult to clean.
3. High capital and operating cost.
4. High headspace required for demounting rotor for inspection and cleaning.



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Expanding Flow Evaporators

1. Entrainment Separators
2. Vapor release chamber
3. Wire Pad
4. Vapor release drum size
5. Centrifugal Separator

Fig. Evaporator with vapor separator and Entrainment Separator



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Thank you