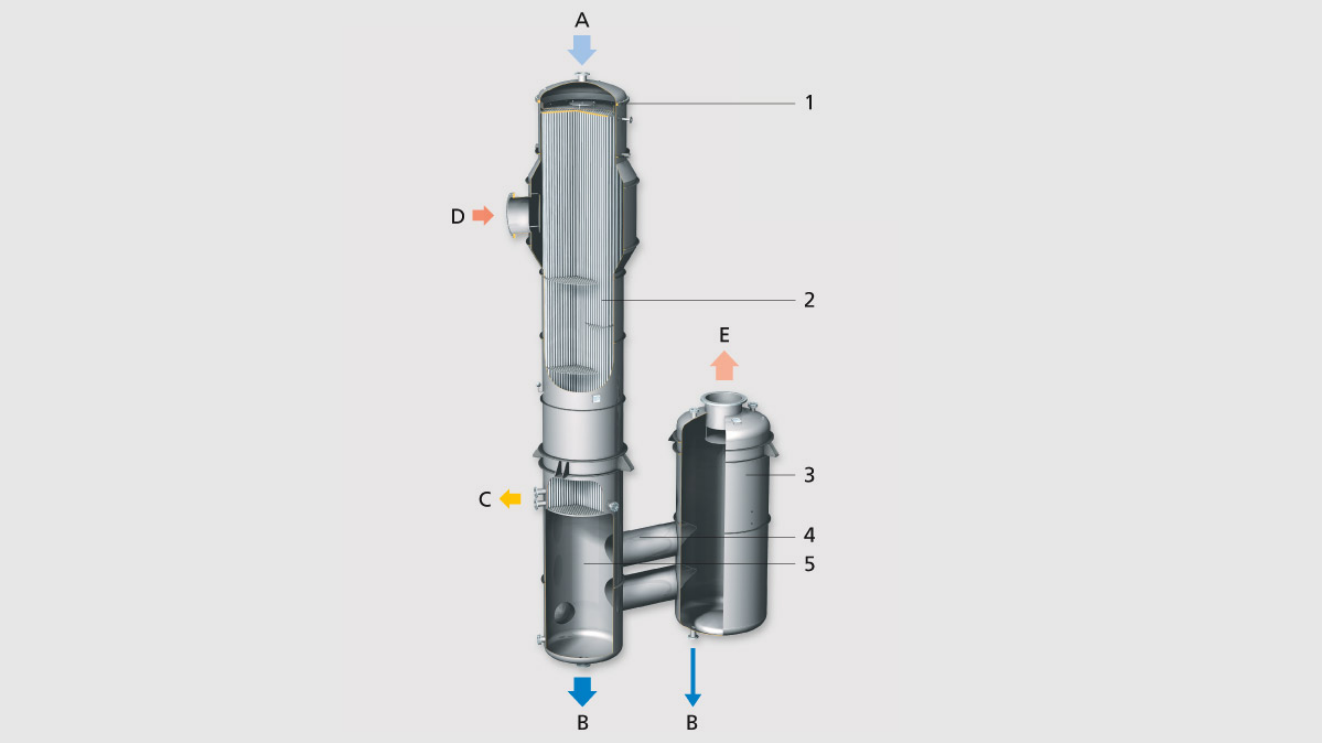
# СИСТЕМЫ ИСПАРЕНИЯ И КРИСТАЛЛИЗАЦИИ

## Испарители

## Технические характеристики

# Vertical shell-and-tube heat exchanger, with a laterally or concentrically arranged centrifugal separator.




A = Product, B = Concentrate, C = Condensate, D = Heating steam, E = vapor, 1 = Head, 2 = Calandria, 3 = Separator, 4 = Separator duct, 5 = Calandria base

The liquid to be concentrated is supplied to the top of the heating tubes and distributed in such a way as to flow down the inside of the tube walls as a thin film. The liquid film starts to boil due to the external heating of the heating tubes and is partially evaporated as a result. The downward flow, caused initially by gravity, is enhanced by the parallel, downward flow of the vapor formed.

Residual film liquid and vapor is separated in the lower part of the calandria and in the downstream centrifugal droplet separator. It is essential that the entire film heating surface, especially in the lower regions, be evenly and sufficiently wetted with liquid. Where this is not the case, dry spots will result that will lead to incrustation and the build-up of deposits.

For complete wetting it is important that a suitable distribution system is selected for the head of the falling film evaporator. Wetting rates are increased by using longer heating tubes, dividing the falling film evaporator into several compartments or by recirculating the product.

Particular features
Best product quality – due to gentle evaporation, mostly under vacuum, and extremely short residence times in the falling film evaporator.
High energy efficiency – due to multiple-effect arrangement or heating by thermal or mechanical vapor recompressor, based upon the lowest theoretical temperature difference.
Simple process control and automation – due to their small liquid content falling film evaporators react quickly to changes in energy supply, vacuum, feed quantities, concentrations, etc. This is an important prerequisite for a uniform final concentrate.
Flexible operation – quick start-up and easy switchover from operation to cleaning, uncomplicated changes of product.
Fields of application
Capacity ranges of up to 150 t/hr, relatively small floor space requirement.
Particularly suited for temperature-sensitive products.
For liquids which contain small quantities of solids and have a low to moderate tendency to form incrustations.

# Natural Circulation Evaporator

Operation
The liquid to be concentrated is supplied to the bottom and rises to the top of the heating tubes in accordance with the “mammoth pump” or rising film principle.

Due to the external heating of the tubes the liquid film on the inside walls of the tubes starts to boil releasing vapor. The liquid is carried to the top of the tubes as a result of the upward movement of the vapors formed. The liquid is separated from the vapors in the downstream separator and flows through a circulation pipe back into the evaporator, ensuring stable and uniform circulation.

The larger the temperature difference between the heating chamber and the boiling chamber, the greater the intensity of evaporation and, consequently, the liquid circulation and heat transfer rates.

RELATED PRODUCTS
Evaporation Test Facilities at Karlsruhe R&D Center
Falling Film Evaporator
Forced Circulation Evaporator
Lean Compact Evaporator
Plate Evaporator
REQUEST INFORMATION
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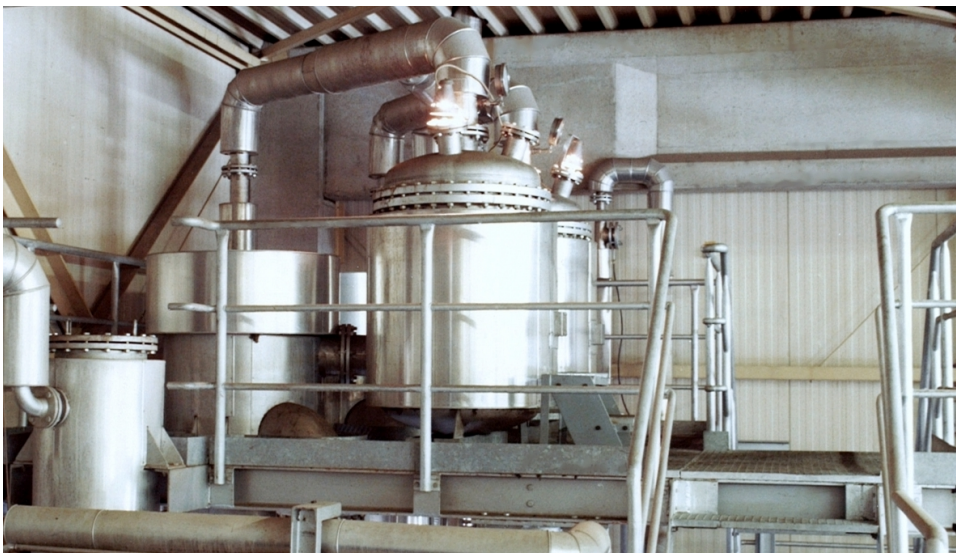
Your Message

I have read and agree to the Privacy Policy



Where the boiling chamber of the circulation evaporator is divided into several separate chambers, each one equipped with its own liquid circulation system, the heating surface required for high final concentrations can be considerably reduced compared to an undivided system based on the same evaporation rate.

The final concentration is only reached in the last chamber. In other chambers, the heat transfer is considerably higher due to the lower viscosities and boiling point elevations.

Particular features
Quick start-up and large specific capacity – The liquid content of the evaporator is very low due to the relatively short length and small diameter of the heating tubes (1-3 m).

Fields of application
For the evaporation of products insensitive to high temperatures, where large evaporation ratios are required.
For products which have a high tendency to foul and for non-Newtonian products, where the apparent viscosity may be reduced by the high velocities.
The circulation evaporator with divided boiling chamber and top-mounted separator can be used as a high concentrator.

# Forced Circulation Evaporator

Horizontal or vertical shell-and-tube heat exchanger or plate heat exchanger as the calandria, with flash vessel/ separator arranged above the calandria, circulation pump.

The liquid is circulated through the calandria by means of a circulation pump, where it is superheated at an elevated pressure, higher than its normal boiling pressure. Upon entering the separator, the pressure in the liquid is rapidly reduced resulting in some of the liquid being flashed, or rapidly boiled off.

Since liquid circulation is maintained, the flow velocity in the tubes and the liquid temperature can be controlled to suit the product requirements independently of the pre-selected temperature difference.

Particular features

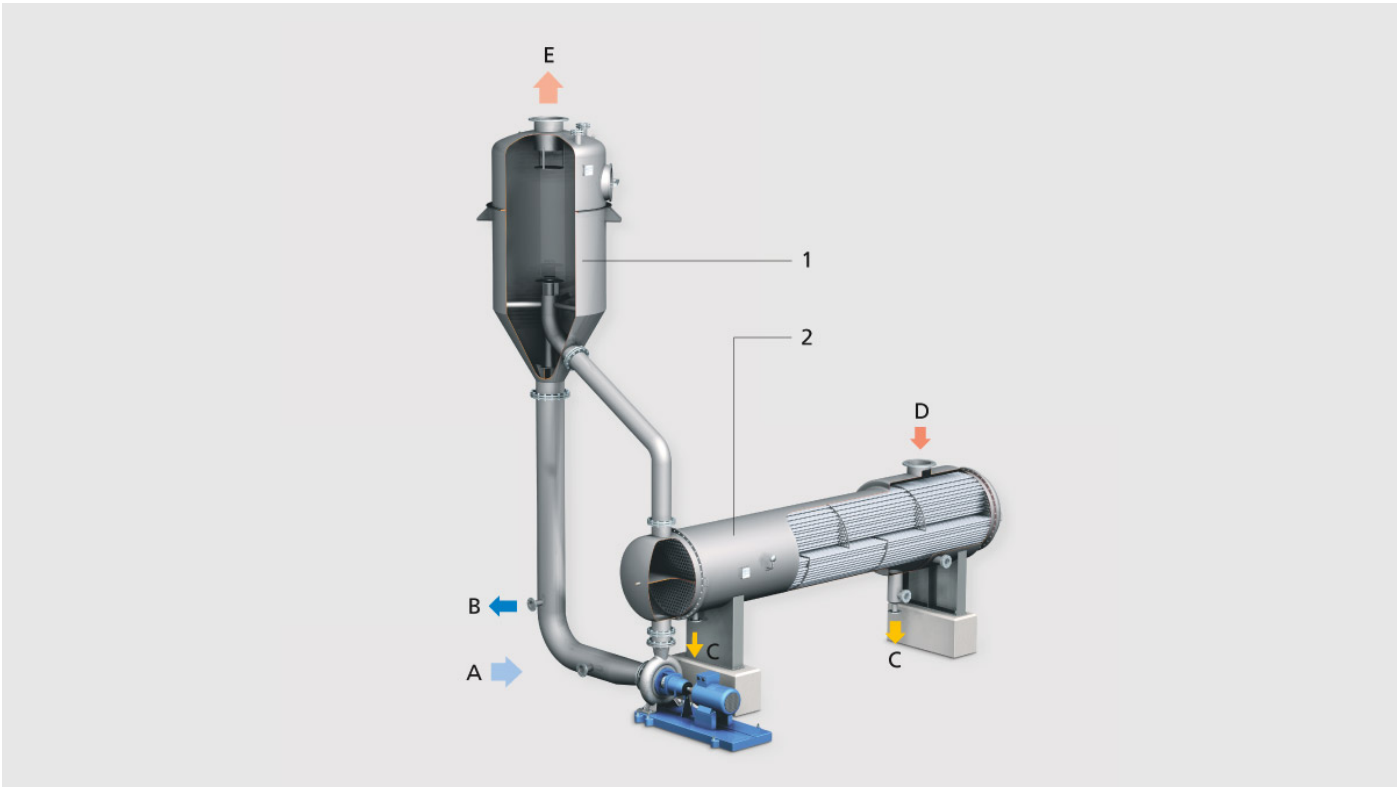
Long operating periods – boiling/evaporation does not take place on the heating surfaces, but in the separator. Fouling due to incrustation and precipitation in the calandria is therefore minimized.

Optimized heat exchange surface – flow velocity in the tubes determined by the circulation pump.

Fields of application

Liquids with a high tendency for fouling, highly viscous liquids, as the high concentration step in multiple-effect evaporation plants.

Forced circulation evaporators are optimally suited as crystallizing evaporators for saline solutions.

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