



# Evaporation

Thermal concentration for instant coffee plants

**GEA's coffee extract evaporation systems are designed to achieve maximum quality and efficiency with minimum downtime**

Concentration by evaporation is an important and highly energy efficient dewatering step that maximizes the solids content of the extract prior to freeze or spray drying.

As the coffee extract is a thermally sensitive product, mild processing conditions throughout the concentration step are essential. In our multi-stage evaporators, the water is gently removed under vacuum at low temperature keeping the original coffee extract taste. The design of GEA evaporator systems is focused on maintaining high product quality with optimal energy efficiency, they are equipped with either thermal or mechanical vapor recompression for this purpose.

Maintaining careful control of the operating parameters during the evaporation process is very important to ensure the functional

properties and quality of the coffee extract, focusing on consistent production to specification. Our solutions achieve extended operating cycles by reducing product build-up on the contact surfaces. This translates into greater plant operating efficiencies and increased profitability. Notable benefits include the following:

- high reliable operation – experienced technical design combined with tailor-made solutions
- gentle product treatment – low product boiling temperatures under vacuum for high product quality
- maximized energy efficiency – using mechanical or thermal vapor recompression
- hygienic design – Clean-in-Place (CIP)-compatible with automatic sequences
- reduced maintenance – no moving parts, minimum number of gaskets, low risk of air or product leaks
- sustainable solutions – flexible design according to local and regional conditions

## Process description

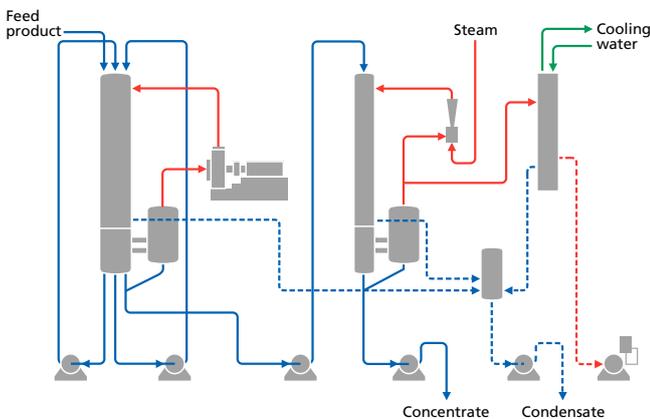
Concentration is achieved by increasing the total solids content of the extract by removing water (evaporation) prior to the spray or freeze drying process. Before drying the coffee extract, it is concentrated to a solids content of 38–46% for freeze drying and approximately 50% for spray drying.

All GEA evaporator systems provide pre-heating with an optimized heat recovery system to reduce energy consumption and ensure that the correct functional properties are achieved in the coffee extract concentrate. The low residence time, often as short as 10–12 minutes, combined with the low heating temperatures provides the following benefits:

- minimum heat load on product
- short start-up and shutdown times
- low product losses
- reduced cleaning time and costs.

## MVR evaporation (Mechanical Vapor Recompression)

- For applications in which the availability of steam is restricted or expensive, GEA recommends a MVR system, which uses fans with electrical drives to recompress the vapor generated during evaporation to a higher temperature and reuses it as heating source for the same evaporator. The MVR can also be fitted with a wraparound separator that considerably reduces the space required while matching the high efficiency of a traditional tangential separator. Further benefits of a MVR evaporator include:
  - lower operating temperature
  - significant reduction of cooling water consumption
  - low energy consumption (both heating and cooling)
  - electrically supplied recompression power (reduced steam requirement)
  - easy and fast operation



Falling film pre-evaporator with mechanical vapour recompression and TVR heated finisher in special design for coffee extract.

## GEA Wiegand GmbH

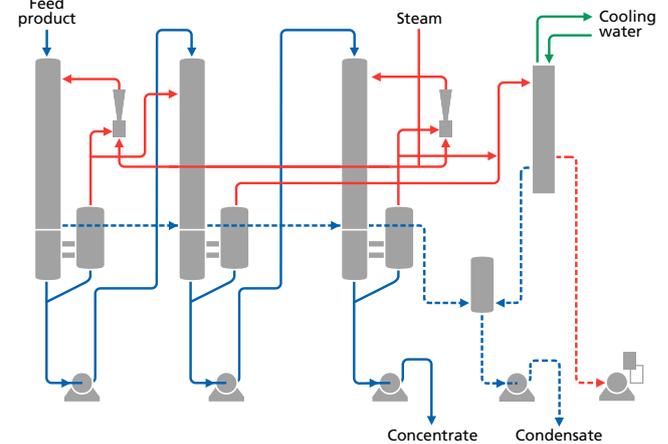
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## TVR evaporation (Thermal Vapor Recompression)

With multiple evaporator-based effects and TVR, the evaporative energy in the first unit is derived from a steam injector that compresses vapor from one of the associated units to a higher temperature. The heating medium in any subsequent unit is the vapor generated in the previous one. Vapor from the final step is condensed by cooling water in a condenser. The hot condensate can be reused for preheating and CIP water.



Falling film pre-evaporator with thermal vapour recompression and TVR heated finisher in special design for coffee extract.

## Direct steam-heated evaporation

Direct steam-heated equipment uses live steam as energy source for the evaporation. To optimize steam consumption, a combination of multiple evaporator effects is applied. Steam vapor provides the initial heat and the condensed steam is then collected and reintegrated into the boiler system. Subsequently produced vapor heats the second stage and so on, until steam provided by the final stage is condensed with cooling water.

GEA has proven experience in providing the right technology for your specific evaporation application. With more than 100 years of development know-how, we understand that the right choice of evaporation technology is critical to achieving optimum quality and efficient production.

Our tailor-made solutions are designed to fulfill our customers' requirements for technology and safety standards, offering fully automated control and measurement functionalities and, with long-term operation in mind, are both energy efficient and environmentally sustainable.

