



Forced Circulation Evaporators

Gemina[®]

www.gemina.es

Forced Circulation Evaporators

APPLICATIONS

- Designed for the evaporation of products with high content of solid matter and/or high viscosity.
- Tomato juice concentrate.
- Fruit concentrate.
- Tropical fruit concentrate (mango, papaya, etc.)
- Berry fruit concentrate (strawberries, blueberries, etc.)
- Applicable to all food industry sectors where some water content needs to be eliminated from the raw material while keeping its organoleptic properties unaltered.

HOW IT WORKS

Evaporation is the elimination of the solvent, in form of vapor, from a solution. For most evaporation systems, the solvent is water and the heat is provided by steam condensation.

Therefore, vapor is the unwanted byproduct and could be recovered (or not) in accordance to its energy value.

Thus, evaporation is normally carried out by evaporating a portion of the solvent, producing a concentrated solution.

MAIN COMPONENTS

There are three main factors to take into consideration in the design of an evaporator: the **heat transfer**, the **liquid-vapor separation** and the **energy consumption efficiency**. The units where the thermal transfer takes place are called heating units or calandria (single tube heat exchangers.) The liquid-vapor separators are called flash chambers or separation tanks.

The basic module of an evaporator is referred to as “the body”, comprising the calandria and the flash chamber.

The term “effect” is used to describe the body where vapor is extracted from the raw material and is operating at the same boiling point.

Multi-effect evaporator is an evaporation system where the extracted vapor from the first effect is used as a heating medium for the second effect, at a lower pressure, and so on, upon the number of effects.

The heating of the product is done by the recirculation of the same in the heat exchanger so that it is later partially evaporated when the pressure is reduced in the flash chamber.



The generated liquid is normally heated only a few degrees in each passing by a heat exchanger. To keep a good heat transfer within the exchanger, it is necessary to have a high value in the recirculation flow.

With the increase of number of effects, an increase in the capabilities of work is achieved, as well as an optimization in the ratio of energy consumption and production.

ADVANTAGES AND DESIGN CHARACTERISTICS

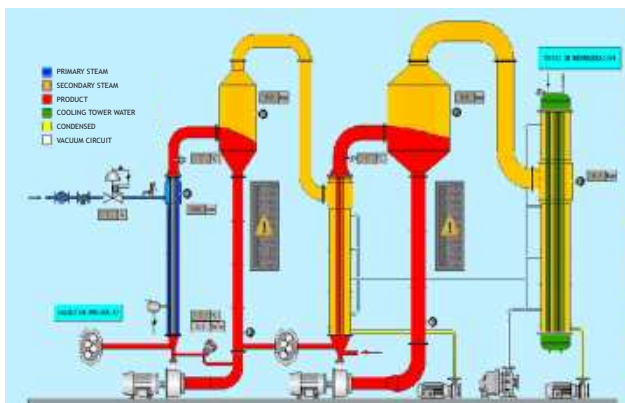
- Custom design of heat exchangers adapted to the application and to the product to be concentrated.
- Expansion chambers of big dimensions, designed to avoid drag-out effects (drag-out losses appear because of the presence of product drops in the vapor, which cannot be separated due to speed of the latter), splashes and foams with the consequent product loss.
The chambers incorporate a cleaning system.
They are completely CIP-ready in case CIP is needed.
- -Centrifuge rotor circulation pumps, which assure big flow together with excellent height values.
- Modular design: a single or double effect exchanger can be expanded in the future thanks to its structure, designed to increase production and decrease costs of future investments.
- Complete pre-assembly in frames, which allows an easy and quick installation.

With our multi-effect evaporators, the effects can be neutralized so that a triple or double effect can become a single effect. This is useful for smaller productions or for the multi-effect operation itself, since there is no product waste when the production is finishing.

- Direct or indirect condenser, according to the evaporator size. The image below shows an indirect condenser:



- Low loading losses, high thermal exchange coefficient and high circulation flow.
- Low embedding and fouling coefficient, which reduces the frequency of cleaning cycles.
- Absence of noise and vibrations, less stress in joints, pipes and weldings, which in the long term lengthens the machine's life time.
- First quality materials: AISI 304 and AISI 316 steels. Quality and reliability: top brands in valves and pumps.
- High level of automation, with the possibility to choose the level of automation demanded by the customer.
- Possibility to include a Supervisory Control and Data Acquisition (SCADA), which allows to visualize and monitor the field variables and keep a log of the process data.
- The line is managed by a desktop computer and a color touch screen connected in a network to the PLC.

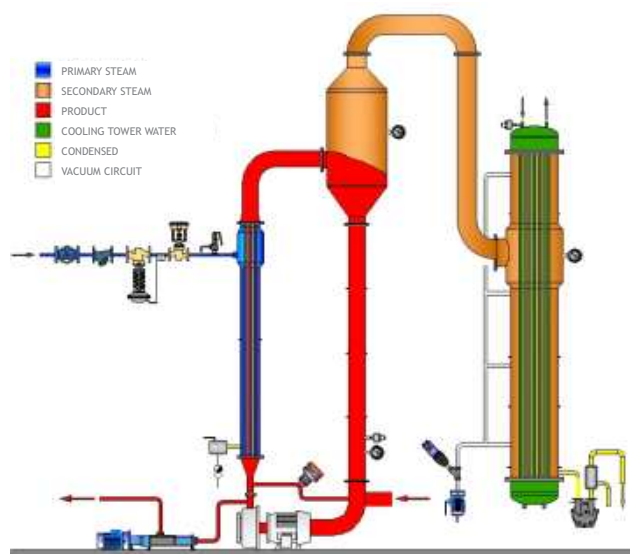


The program shows and allows the control of variables such as opening of valves, speeds of pumps, level of filling, configuration of operating parameters, registration and visualization of alarms, registration and visualization of production data, graphical visualization of process variables (pressures, temperatures, etc.), indication of operative stages in the plant (filling, production, cleaning, etc.), dump of data from PC and printout of data log.

- Control of brix degree (concentration) with high quality and accuracy refractometer.
- Low costs in spare parts and maintenance.

CONFIGURATIONS

- SINGLE EFFECT



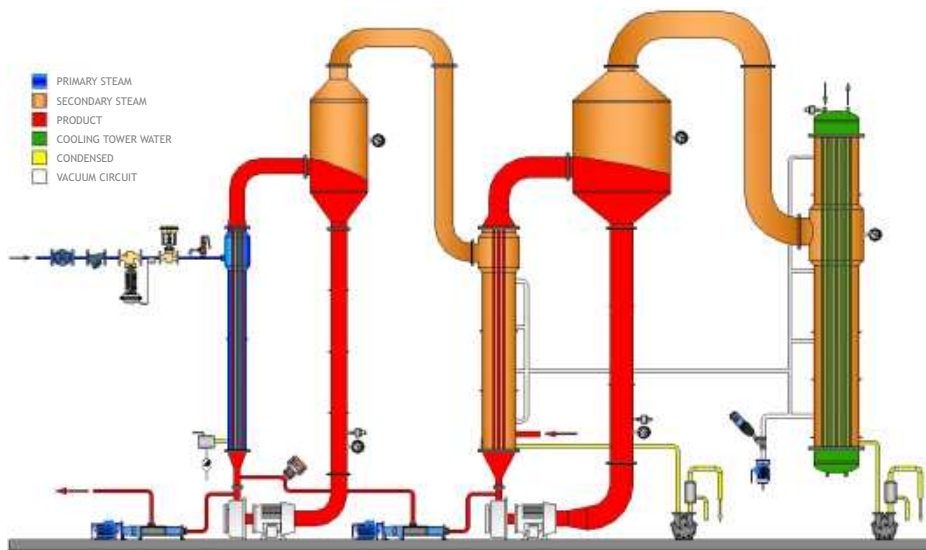
A unique base unit plus a condenser to condense the vapors extracted from the heat exchanger.

The product is recirculated until the desired concentration is obtained, measured with the refractometer.

When it's reached, a lobe pump extracts the product.



• DOUBLE EFFECT



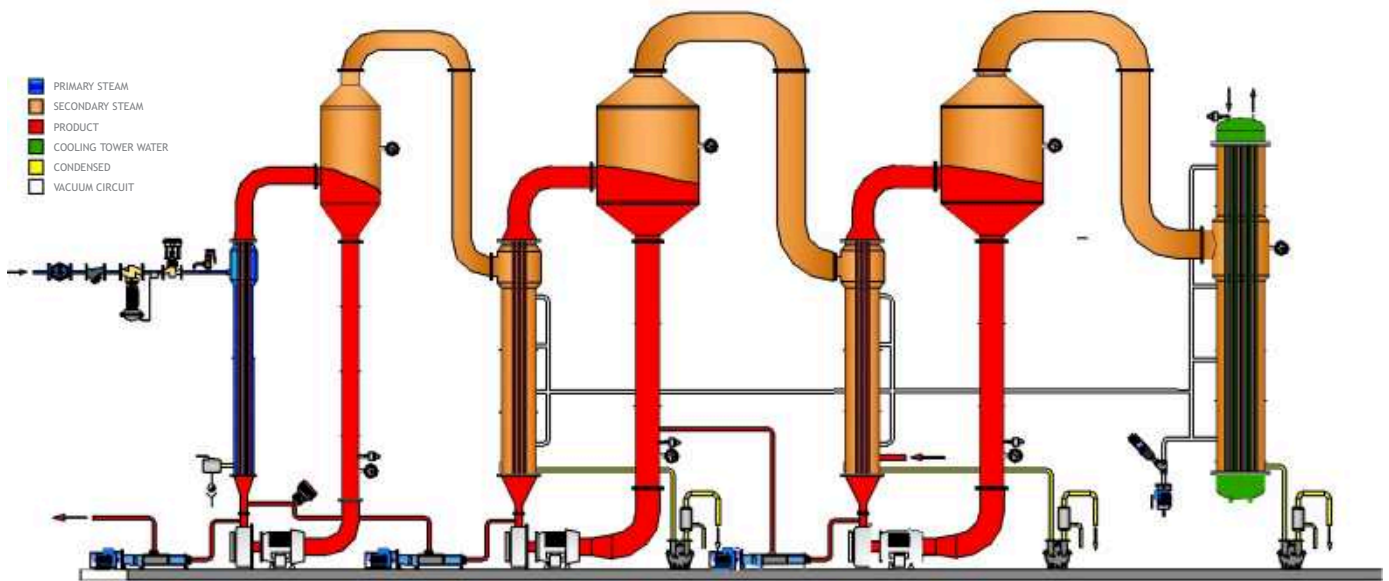
These are two base units of forced upward circulation flow. With the term “first effect” we refer to the stage fed by living vapor coming from the boiler. Both effects work with decreasing pressure from the first to the second effect.

The product to be concentrated is introduced into the evaporator by the second effect, where it undergoes an initial concentration, although the final (desired) concentration will be obtained in the first effect after the transport between effects with a lobe pump.

The system is completed with a final condenser, whose function is to condense the vapors coming from the second effect.



• TRIPLE EFFECT



They are obtained by using three base units of forced upward circulation flow.

This type of evaporators is designed for transformation industries where high capacity is sought, joining maximum possible energy saving to minimum necessary manpower.

The working principle is the same: the product to concentrate enters through the third effect at a lower

temperature, from there goes into the second effect where the concentration level increases and lastly the desired concentration is reached in the first effect.

There exists the possibility to cancel some effects, thus fractioning the plant and being able to work with a lesser production.



OPTIONAL TVR KIT

TVR systems, known as thermal vapor recompression systems, are applications of vapor stream ejection or thermocompression in an evaporator in order to improve the economic performance of vapor consumption.

They can be used both in single effect evaporators and multi-effect evaporators.

As a general rule, the effect produced by a TVR system in an evaporator of forced circulation can be approximated to

that of adding an additional effect, but with an advantage: a much lesser investment cost. In normal working conditions, a TVR can drag a vapor unit (recirculated from the flash chamber) per living steam unit introduced into the system.

Limited installation space is ideal for the installation of TVR ejectors.

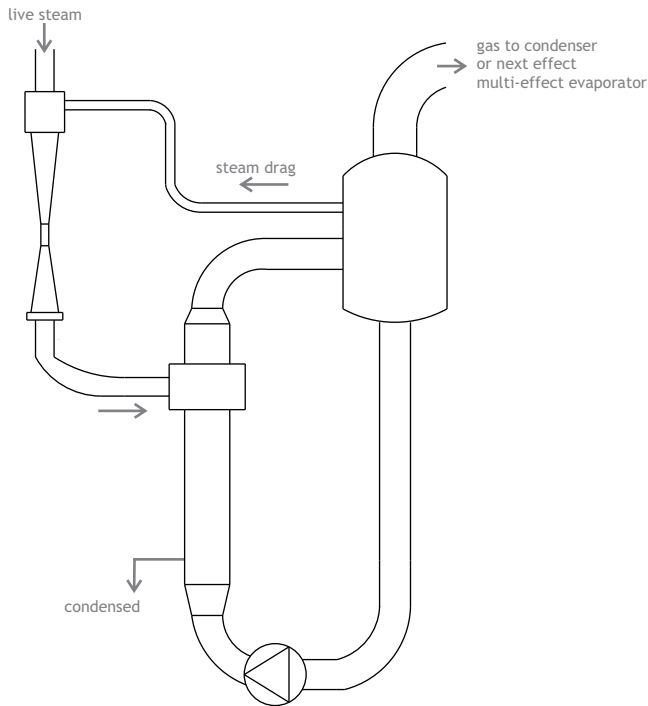


TABLE OF FORCED RECIRCULATION EVAPORATORS MODELS

Forced Recirculation Concentrator							
Model	Max yield (liters/hou)	System	Thrust	Number of Effects	Condensator	System	Control
CF-T/5000-A	5000	Tubular vertical	Centrifuge pump	1	Direct	Forced upward circulation	Automatic
CF-T/8000-A	8000	Tubular vertical	Centrifuge pump	2	Direct	Forced upward circulation	Automatic
CF-T-/10000-A	10000	Tubular vertical	Centrifuge pump	3	Direct	Forced upward circulation	Automatic
CF-T-/15000-A	15000	Tubular vertical	Centrifuge pump	3	Direct	Forced upward circulation	Automatic
CF-T-/20000-A	20000	Tubular vertical	Centrifuge pump	3	Direct	Forced upward circulation	Automatic
CF-T-/30000-A	30000	Tubular vertical	Centrifuge pump	3	Direct	Forced upward recirculation	Automatic

MachinePoint®

Food Technologies

MACHINEPOINT FOOD TECHNOLOGIES was created as a result of a joint-venture between **MACHINEPOINT GROUP** and **GÉMINA**.

MACHINEPOINT FOOD TECHNOLOGIES designs, manufactures and integrates lines, equipment and processes for the food industry, more specifically for the beverage processors, the dairy industry and processors of fruits and vegetables.

MACHINEPOINT FOOD TECHNOLOGIES belongs to an international group specialized in industrial equipment for plastic, packaging and food industries.

The group is headquartered in Spain (Valladolid) and has sales offices in Turkey, Mexico, France, India and North Africa. The engineering center is also located in Spain (Murcia). It is at the engineering center where we manufacture our equipment and have our R & D + I department.

GEMINA PROCESOS ALIMENTARIOS S.L. is a leading equipment manufacturer that provides innovative solutions for the food industry. It has over 25 years experience in designing, manufacturing, assembling, automating and implementing lines and processes.

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