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FORCED CIRCULATION EVAPORATORS

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Procesos Alimentarios, S.L.

HOW IT WORKS

Evaporation is the removal of the solvent, in the form of vapour, from a solution.

In most evaporation systems, water is the solvent and heat is supplied by vapour condensation. In general, steam is not the desired end product, and it could be recovered (or not) based on its energetic value.

Therefore, the evaporation process is normally achieved by evaporating a portion of the solvent, resulting in a concentrated solution.

APPLICATIONS

- Designed for products with high levels of solid material content and/or high viscosity.
- Tomato juice concentrate.
- Fruit concentrate.
- Tropical fruit concentrate (mango, papaya, etc.).
- Red berries concentrate (strawberries, cranberries, etc.).
- Useful in all food industry processes where extraction of some water from raw materials is necessary at the same time maintaining the product's organoleptic properties.

MAIN FEATURES

There are three main features to consider when designing an evaporator: heat exchange, liquid -steam separation, and energy consumption efficiency.

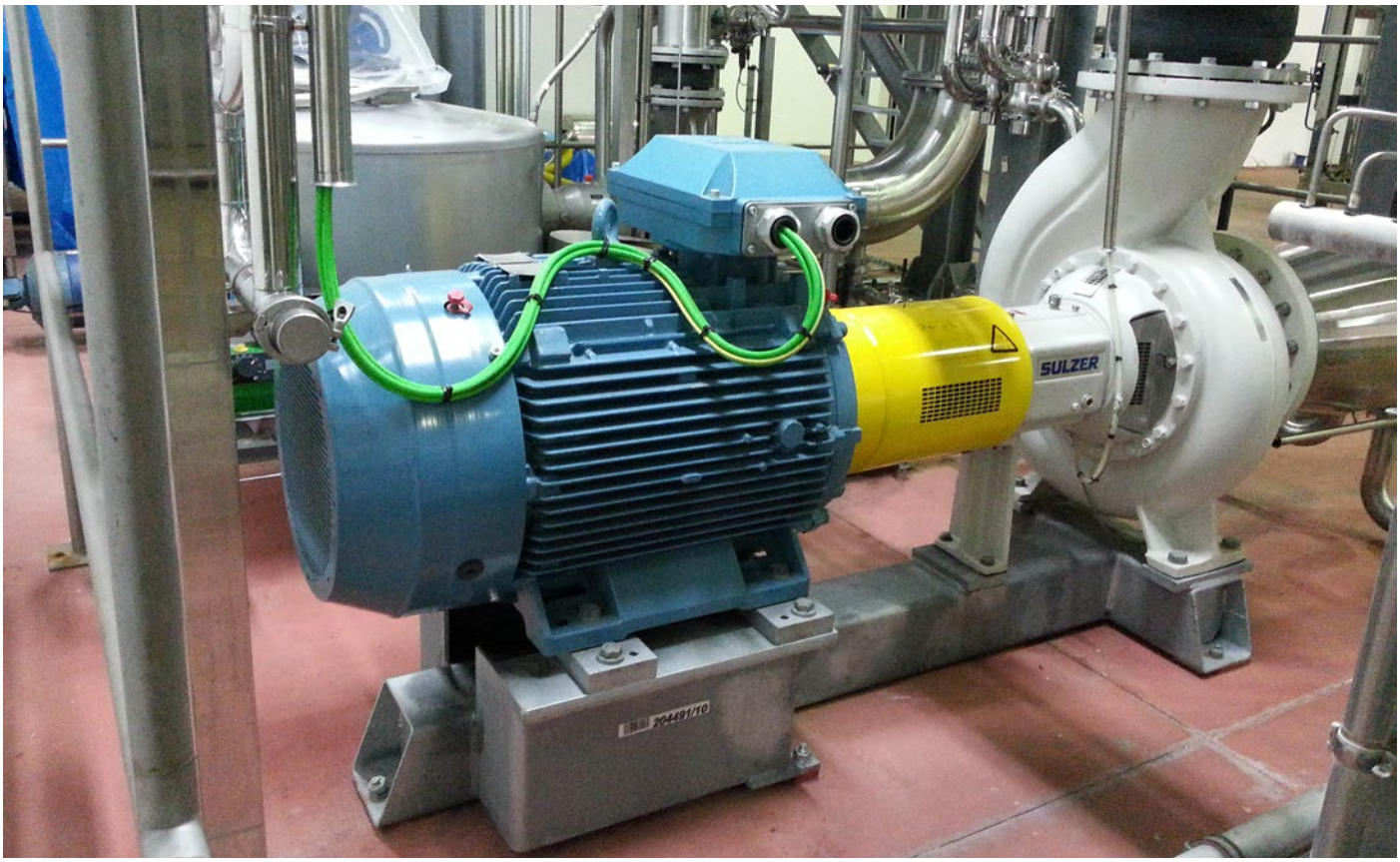
The units where thermal transfer takes place are called heating units or calandria (multi-tubular heat exchangers). The liquid-steam separators are called flash drums or separation tanks.

The term 'body' is used to refer to the basic structure of an evaporator, comprising a heating unit and a flash drum. The term 'effect' is used to describe the body where vapour is extracted out of raw materials by reaching boiling point.

A multiple-effect evaporator is an evaporation systems where the vapour extracted from one effect is used as heating medium for the next effect at a lower pressure.

The product is heated through its recirculation in the heat exchanger to then be partially evaporated when the pressure in the flash drum is reduced. The resulting liquid is generally heated just a few grades at each pass through the heat exchanger. To achieve good heat transfer in the exchanger it is necessary to have a high recirculation value.

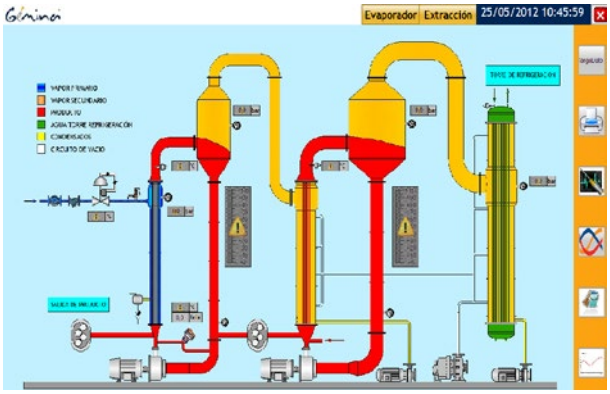
By increasing the number of effects, it is possible to expand working capacity and at the same time optimise the relation between energy consumption and production.



MANUFACTURING FEATURES AND ADVANTAGES

- Design of heat exchangers adapted to suit the type of end use and product to be concentrated.
- Large expansion chambers, designed to avoid dragging effects (losses resulting from dragging effects occur because drops of products present in the steam cannot be separated given the speed of the steam), product splatters and foams, with the resulting loss of product.
- Chambers with cleaning systems incorporated. Complete C.I.P. solutions incorporation available if necessary.
- Centrifuge rotor circulation pumps ensure the combination of large product flow speed combined with excellent height values.
- Modular design: simple effect or double effect heat exchangers can be expanded later thanks to its structure, which is designed to increase production and lower future investments costs.
- Complete pre-assembly on frames for easy and fast installation.
- With our multiple-effect evaporators, some effects can be shut-off in such a way that a triple or a double effect can be converted into a simple effect. This is useful for low quantities or for the functioning of the multiple-effect because there is no product waste at the end of the production cycle.
- Direct or indirect condensers based on the size of the evaporator.

The following illustration shows an indirect condenser:



- Low loading loss, high thermal exchange coefficient and high circulation flow.
- Reduced embedding and fowling coefficients, reducing the frequency of cleaning cycles.
- Noiseless and without vibrations. Less tension at joints, pipes and welds, providing, in the long run, greater equipment longevity.
- High quality materials: steel AISI 304 and AISI 316. Quality and reliability: valves and pumps from the best brands in the market.
- High automation, with the possibility to choose the level of required automation required by the client.
- Possibility to incorporate a Supervisory Control and Data Acquisition (SCADA) system, which allows visualisation and control of field variables as well as keeping a log of process data.
- The line is controlled through a desktop computer fitted with a colour touch screen, linked to the PLC through network connexion.

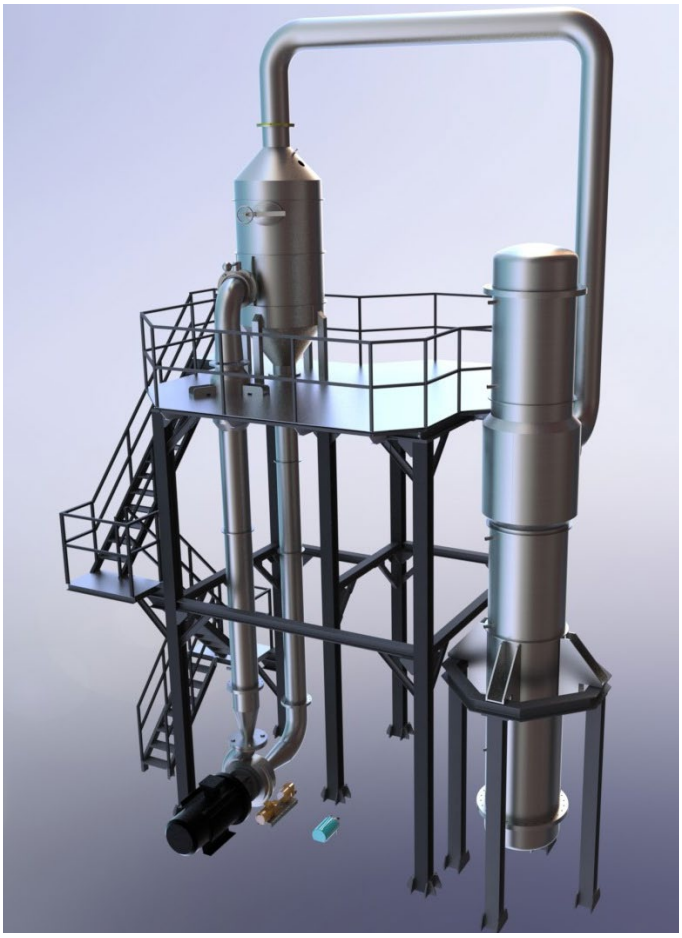
The program shows and allows the control of variables such as opening of valves, pump speed, fill level, configuration of operation parameters, alarm registration and visualisation, production of and visualisation of data logs, graphs of process variables (heat, temperature...), indicator of operating phase of the plant (filling, production, cleaning, etc.), data download from the machine's computer and data log print-out.

- Control of Brix degree level with a high-quality high-precision refractometer.
- Low costs of replacement parts and of maintenance.

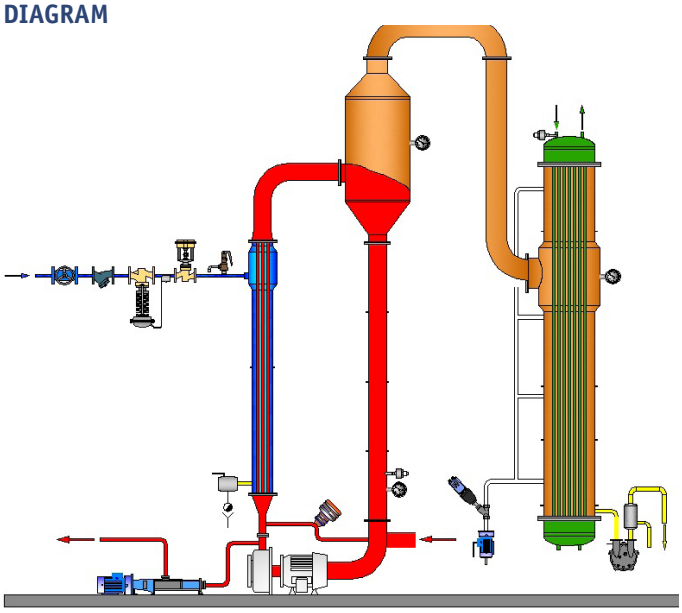
CONFIGURATIONS

Simple effect

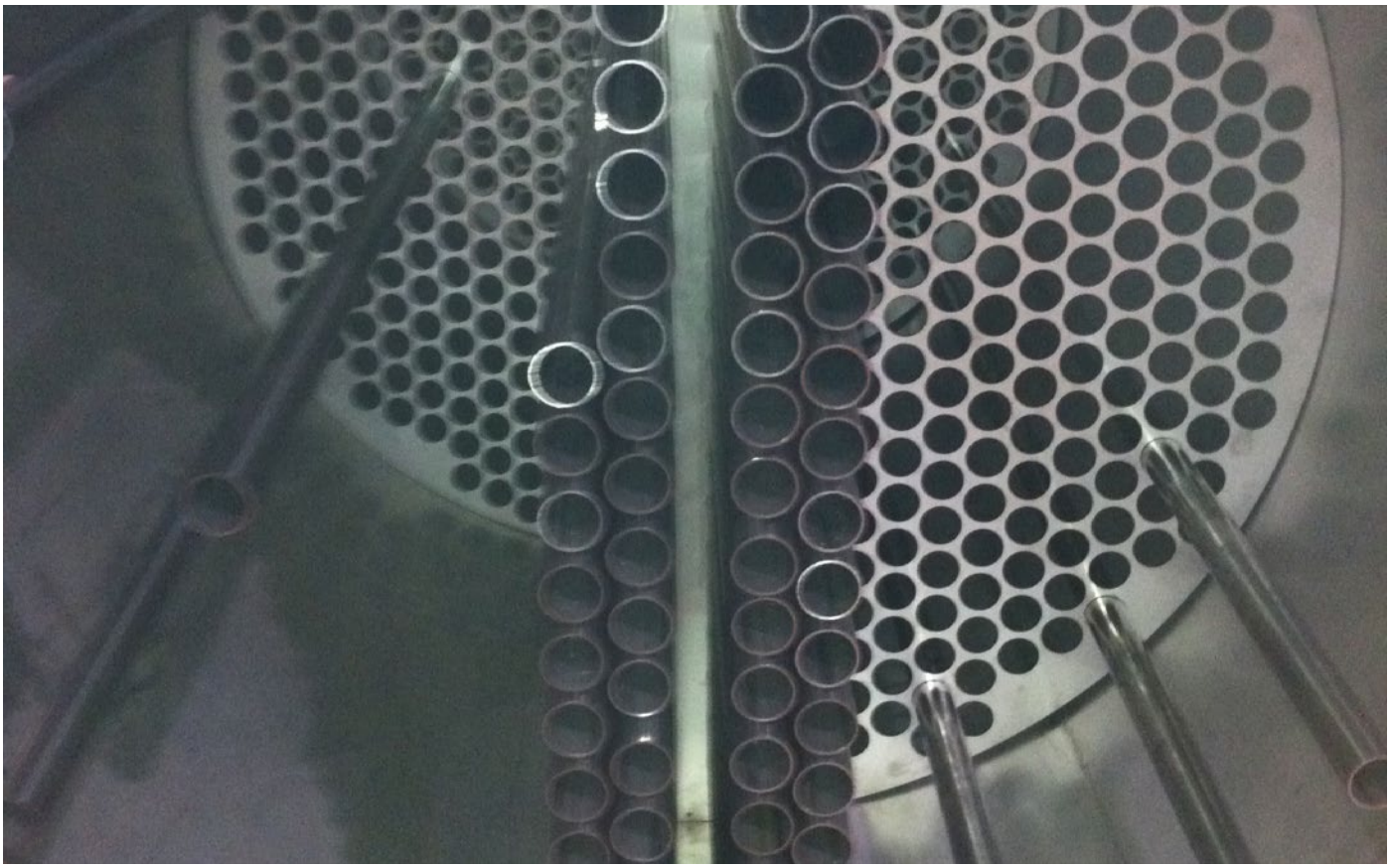
A single base unit plus a condenser to condensate the steam extracted from the heat exchanger. The product is recirculated until the desired concentration is achieved, measured by a refractometer. The product is then extracted using a lobe pump.



DIAGRAM



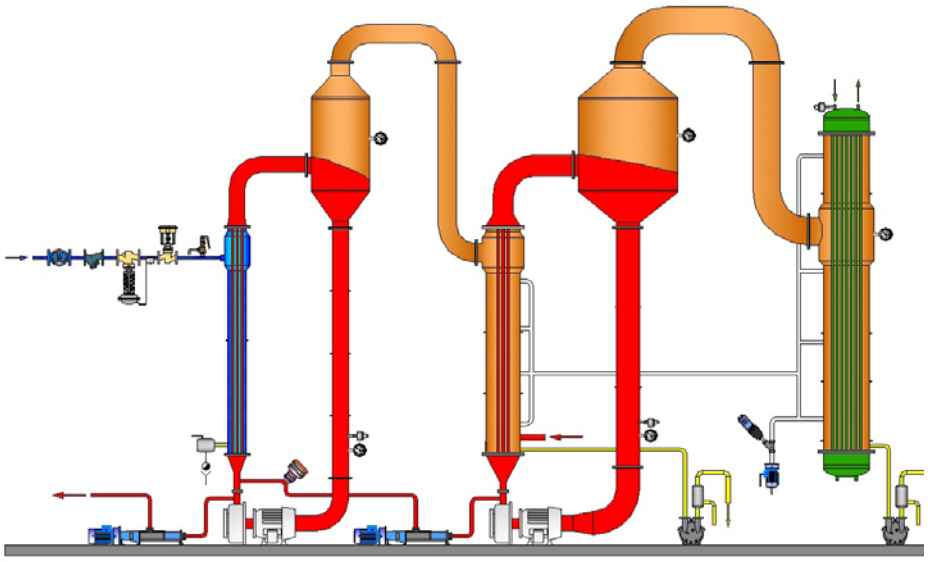
- Primary steam
- Secondary steam
- Product
- Cooling water tower
- Condensers
- Vacuum circuit



Double effect

A double effect is obtained using two base units of forced upward-flow circulation. With the term “First effect”, we refer to the stage fed by live steam coming from the boiler. Both effects work with downward flow going from the first to the second effect. The product to be concentrated is introduced into the evaporator from the second effect, where it undergoes a first concentration, although the final (desired) concentration is obtained in the first effect after decanting the product between effects with a lobe pump. The system is completed with a final condenser, whose function is to condense the steam coming from the second effect.

DIAGRAM



Primary steam
Secondary steam
Product
Water cooling tower
Condensers
Vacuum circuit

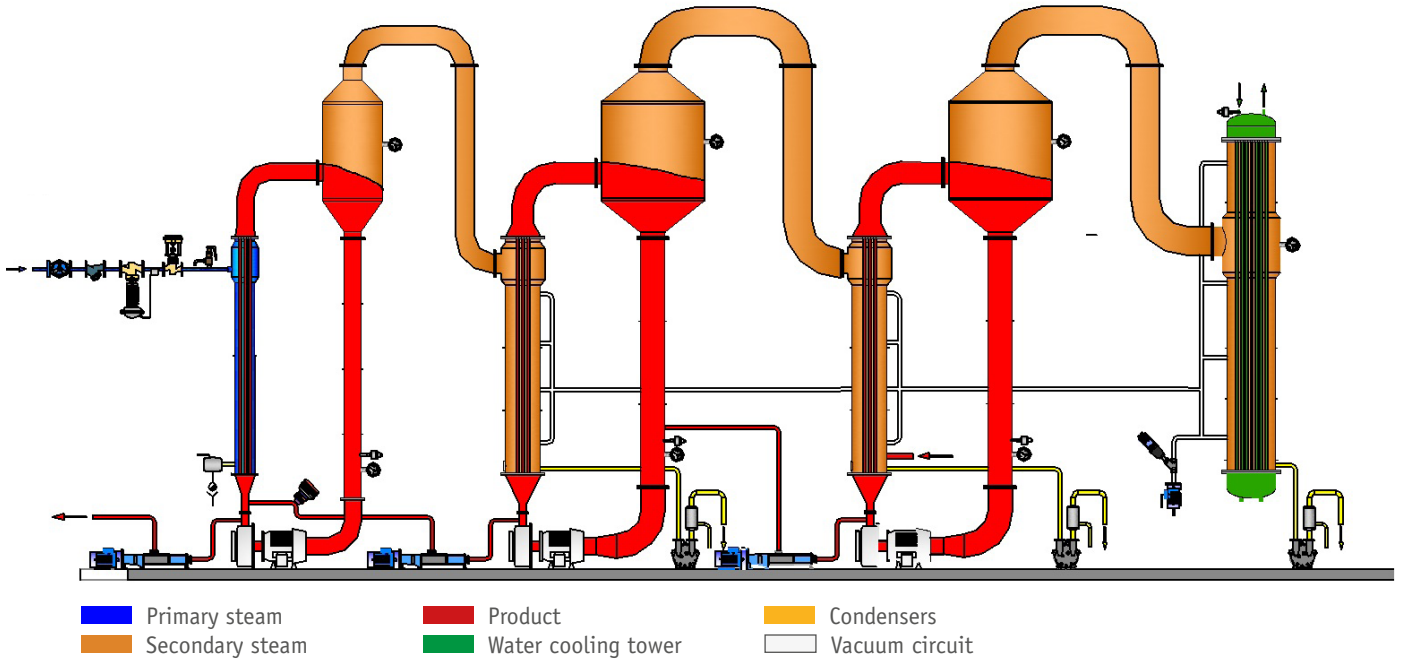
Triple effect

A double effect is obtained using three base units of forced upward-flow circulation. This type of evaporators are designed for processing industries that want high capacity plants, joining the maximum possible energy savings with the minimum quantity of workforce needed.

The operating principle is the same: the product to be concentrated enters from the third effect at a lower temperature, from there it goes into the second effect where the concentration level is increased, and finally the desired level of concentration is achieved in the first effect.

It is possible to deactivate some effects, so as to split the plant and be able to work with a lower workload.

DIAGRAM



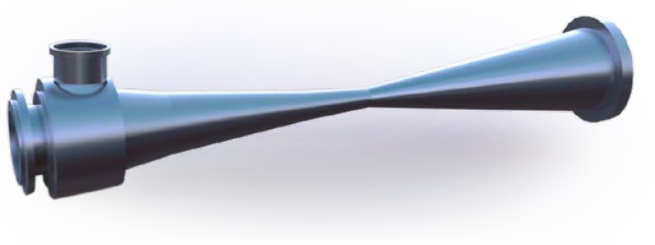
OPTIONAL KIT: TVR

TVR systems, also known as thermal vapour recompression systems, are applications of steam jet ejection or thermocompression to improve the economic performance of vapour consumption.

These can be used with both single effect and multiple-effect evaporators.

As a general rule, the effect produced by a TVR system on a forced circulation evaporator is similar to that of adding an additional effect to the evaporator, but with one advantage: lower investment costs. In normal working conditions, a TVR system can drag a steam unit (recirculated from the flash vessel) per unit of live steam introduced into the system.

Installations with space restrictions are ideal for the placement of TVR ejectors.



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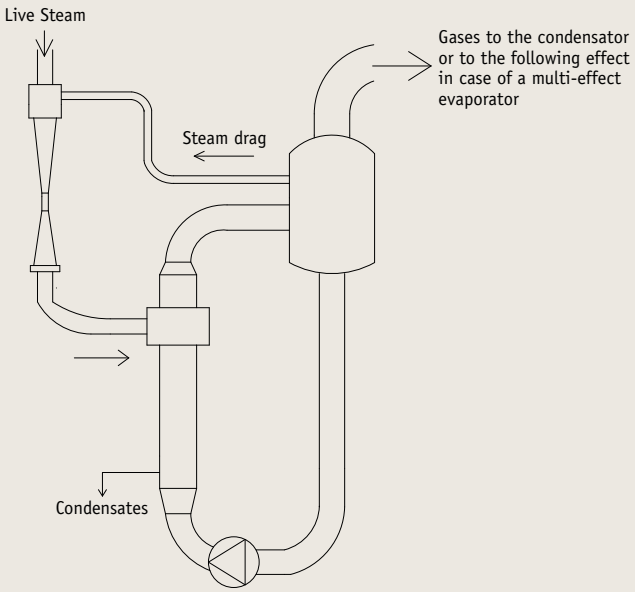

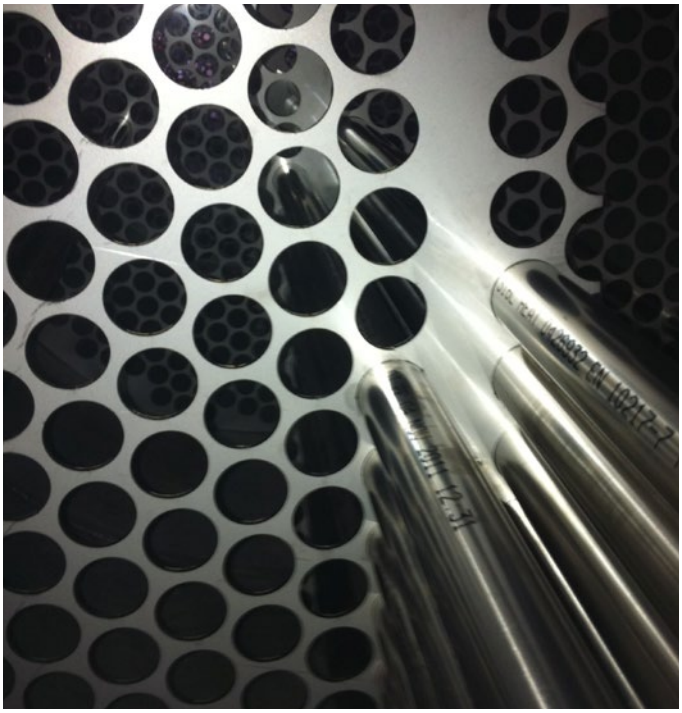

Forced circulation evaporator models

FORCED CIRCULATION EVAPORATORS							
Model	**Maximum capacity (L/H)**	**System**	**Thrust**	**Effect Number**	**Condenser**	**System**	**Control**
CF-T/5000-A	5000	Vertical pyro-tubular	Centrifuge	1	Direct	Ascending forced recirculation	Automatic
CF-T/8000-A	8000	Vertical pyro-tubular	Centrifuge	2	Direct	Ascending forced recirculation	Automatic
CF-T-/10000-A	10000	Vertical pyro-tubular	Centrifuge	3	Direct	Ascending forced recirculation	Automatic
CF-T-/15000-A	15000	Vertical pyro-tubular	Centrifuge	3	Direct	Ascending forced recirculation	Automatic
CF-T-/20000-A	20000	Vertical pyro-tubular	Centrifuge	3	Direct	Ascending forced recirculation	Automatic
CF-T-/30000-A	30000	Vertical pyro-tubular	Centrifuge	3	Direct	Ascending forced recirculation	Automatic

Our company

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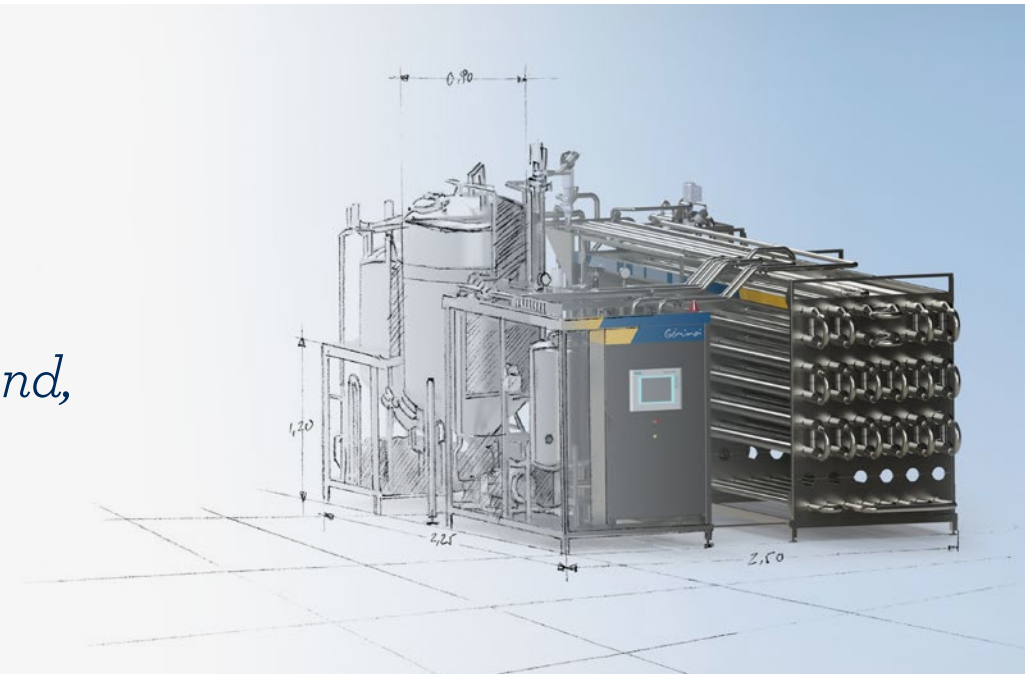
Procesos Alimentarios, S.L.

GÉMINA Procesos Alimentarios, S.L. is located in Jumilla, Murcia, a spanish autonomous region which is a model in food production.

GÉMINA has 25 years of experience in designing, making and integration of systems which offer innovative solutions for the food sector industry.

You imagine and,
we do it.



BUSINESS LINES

Design and manufacture of machinery

- Design, manufacturing and integration of process equipment and food aseptic packing.
- The Manufacture is completely carried out in our installations.
- All our machinery has CE safety certificate and complies with the most exigent standards.
- I+D+i: We bet on technology innovation.

Engineering and design of processes: Projects management

In Gémina, we love our work and, therefore, our engineering department includes from the design, the calculation, the manufacture, the assembly, the automation and the start up of machines and installations. Therefore, we include a global and integral management of all our projects.

We care of every detail of the process and we advise our clients to optimize their product elaboration procedure. Gémina designs every process adapting it to the customers' requirements and standing out our customers' products among their competitors.

- Versatility and flexibility: we can plan from a plant, a simple line expansion to the installation of an equipment in a process.
- Ability of adaptation to different places and circumstances.
- Our engineering department has a big technical capacity and a long experience in this area.
- Gémina guarantees your success because we manage the whole project, reducing risks, costs and deadlines

Services Provided

1 - Technical assistance service: Alfa-Laval official technical and distributor service

- Maintenance service.
- Installation service.
- Calibrations.
- Replacement parts services.
- "Training" service.
- Online monitoring of production process and breakdown resolution.

2 - Automation and Robotics

- Automation of custom-made processes: integral solutions.
- Total Control of the process: SCADA systems, record and control of data.
- Custom-made robotics applications: different solutions for different necessities.

3 - Food Quality

- Optimization, development and validation of processing and packing equipment, besides of food elaboration processes.
- Consultancy for implantation of standards such as: BRC, IFS: ISO 22.000, FSSC...
- Product development [process + formula].

Customer Service

Gémina is characterized by its exclusive and permanent customer service. Our vocation is to become part in an operational way of the companies which we work.

Our closeness, technical competence, wide experience and self-confident are some of the main features why our costumers place their trust into our equipments and services.

Industries

Industrial sectors where GEMINA develops its projects:

- **Dairy industry**
- **Tomato industry**
- **Juice and drink industry**
- **Vegetables and fruits industry**
- **Citrus fruits industry**

Products catalogue

Aseptic fillings

Aseptic machine which fills metal drums with pre-sterilised bags which have pressurised cap. Besides, it also fills carton containers

Bag in box

Aseptic filling automatic feeding of pre-sterilized bags which have pressurized cap and a low volume (1-20 liters)

Extractors

Processing of a wide variety of products to get a puree free of seeds and peels.

Different methods of using: extractor or refiner

Heat exchanger

We offer all kind of models and designs, from single-tube to partial ones or rough surface exchangers.

Forced circulation evaporators

Concentrators which have great capacity and performance for products having great viscosity and a high content in solid matter. Multiple stages which are adapted to the process and needs.

Hot/cold break units

These units process tomato puree and tomato paste guaranteeing the total or partial deactivation of the pectolitic enzymes and allowing the preservation of the pectine.

Laboratory pilot plants

Pasteurization and aseptic packing in the laboratory of small product samples, such as juices, soda drinks, vegetable creams, soups, etc.

Tubular pasteurizer

Project and constructive development of pasteurization plants adapted to different needs.

UHT

Low-acid liquid products (pH>4.5 for milk pH>6.5) are treated at 135-150°C for a few seconds with indirect heating or direct steam injection.

Heaters and coolers

Heating of products before getting through treatments such as refining or mixing. Cooling previous pasteurization treatments.

Cream extraction plants

Cream extractions of all types of fruits and vegetables, in both cold and hot extraction processes.

Aseptic Monoblock

Integration of an aseptic filling in a pasteurization plant, creating a compact, functional and versatile machine which is adaptable to a wide range of products.

Crusher

Defrosting of stored products such as fruit juices, fruit and vegetables pastes, creams, sauces and so on.

Piston Pump

It is conceived to pump viscous products, big particles of products (fruit in cubes or in pieces) or product which are sensible to shear stress.

Inverse osmosis equipment

Reduction of salinity of salty waters and sea waters.

Blending room / blending

Blending by recipes from database and transference of process parameters to pasteurizers.

Emptying of cans by aspiration

Unloading of metal cans and aseptic bags in blending rooms through emptying techniques in very few seconds.

CIP systems

Cip systems are used to carry out the chemical cleaning of food installations in a completely automatic way.

Processing tanks

Storage in aseptic packing tanks for high and low ph products, in liquid or viscous products.

Blending tanks

We have a wide range of vertical and horizontal tanks with different types of shaking and volumes. They are adapted to process needs.

Storage tanks

Storage rooms in stainless steel tanks having standard volumes or custom-made volumes.

Finisher or pulping machine

It refines crushed product to remove peels, stems and seeds.

Hammer mill

It is a grinder of pitted food (vegetables among others) for processing raw material.

Robotics

Robotic applications in proportion to palletized/ depalletized for the start and the end of proccesing and packing lines.

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