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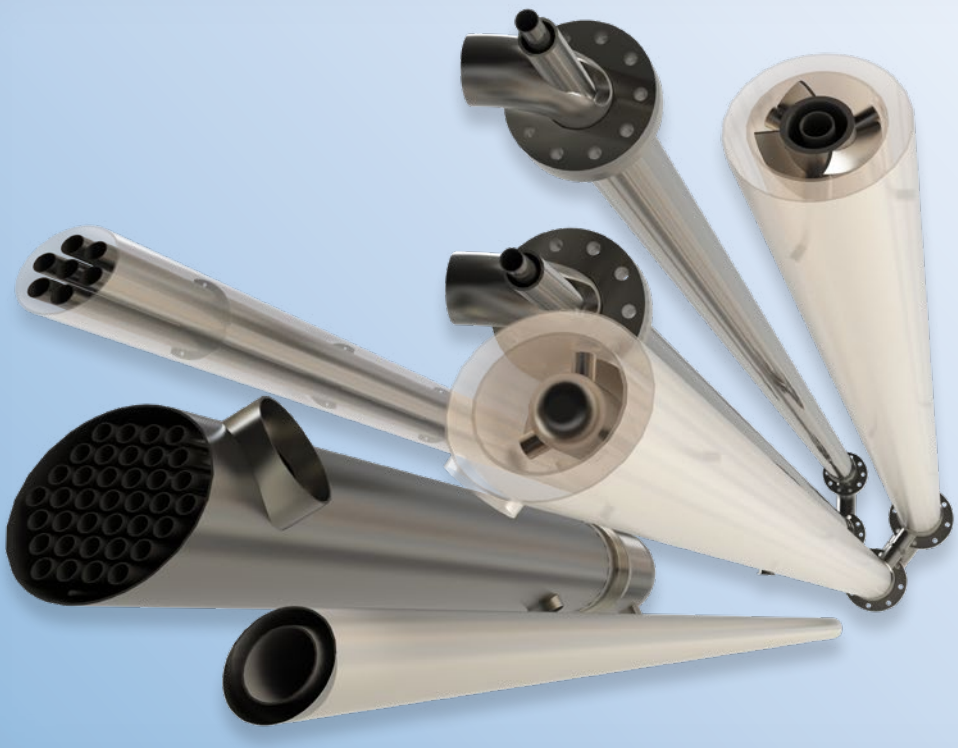
HEATING AND COOLING: HEAT EXCHANGERS



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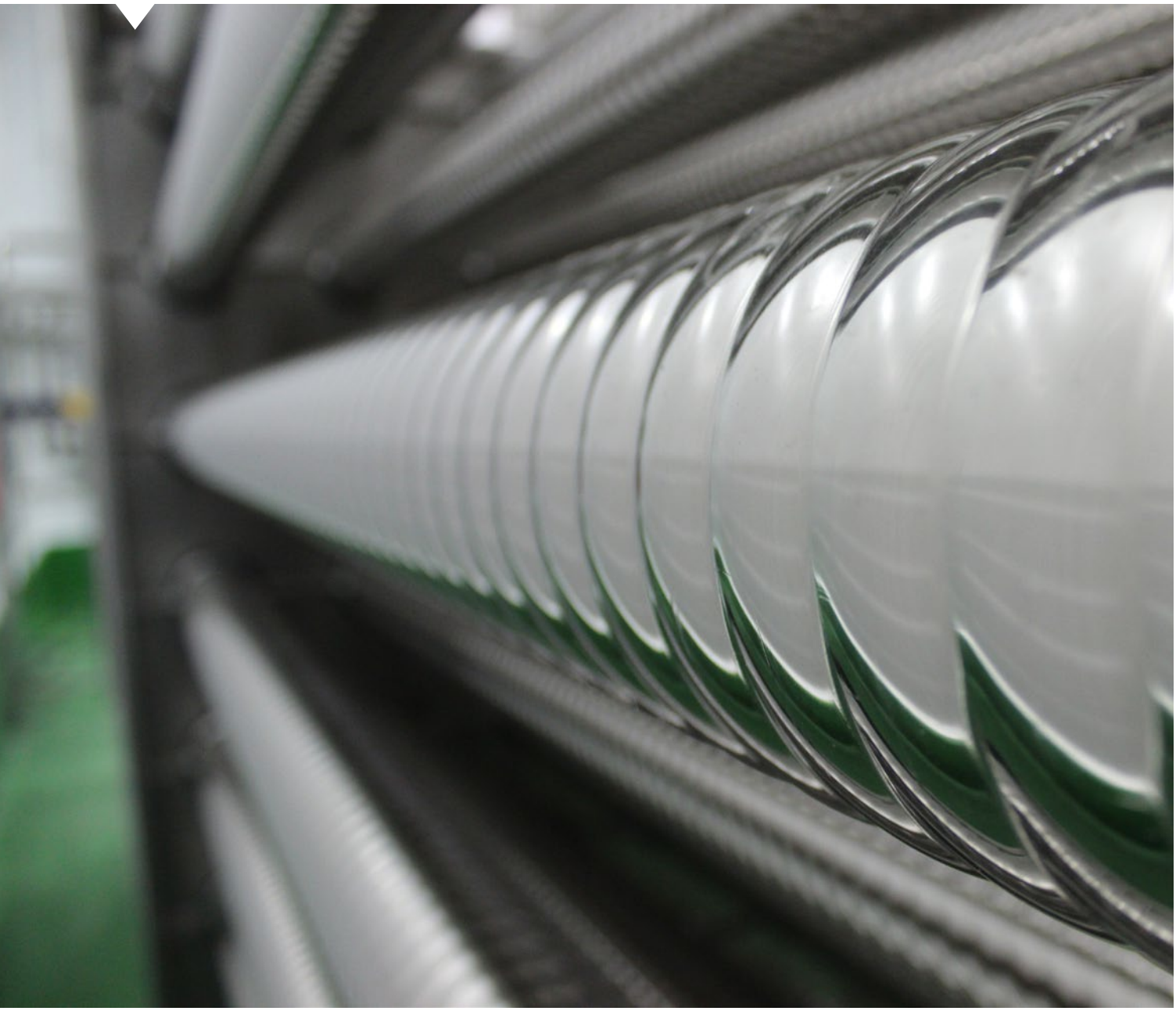
Procesos Alimentarios, S.L.

WHAT IS A HEAT EXCHANGER?

Heat exchangers are devices that facilitate the exchange of heat between two fluids with different temperatures, while at the same time avoiding any mixing of the fluids.



How is heat transmission achieved?

In a heat exchanger, the heat transfer usually includes convection in each fluid, and conduction through the wall that separates them.

Heat conduction is the transfer of energy from the particles of a substance that have higher temperature to particles of this substance that have a lower temperature by way of the interaction of these adjacent particles. Conduction can happen between solids, liquids and gases.

In gases and liquids, conduction is due to collisions and the diffusion of the molecules during random motion.

In solids, it is due to the combination of molecular vibration and energy transport from free electrons.

Convection is the exchange process between a solid and an adjacent liquid or gas in motion, and comprises the combined effects of conduction and the motion of fluids. The faster the motion of fluids, the greater the heat exchange by convection. In the absence of any major movement of fluids, the transfer of heat between a solid surface and the adjacent fluid happens by conduction only.

Convection can be natural or forced. In the former, thermal energy is transferred by means of a natural current until the balance of temperature is achieved. In forced convection, the mix between hot and cold elements is stimulated through the use of a turbulent current.

Types of heat exchangers

Different heat exchange applications require different types of fittings and configurations of the equipment. Innovative designs in heat exchangers exist as the result of the combination, within specific constraints, between different types of fittings and different heat transfer needs.

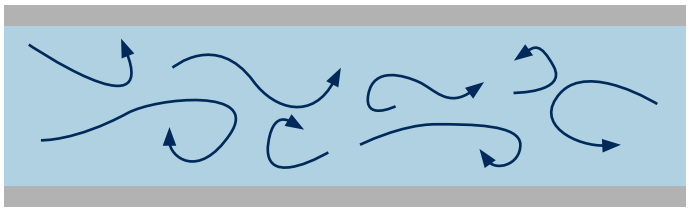
At Gémina we design and manufacture heat exchangers based on the current requirements and needs of the food industry, where plate and scraped-surface exchangers are not feasible due to their high setup costs.

Laminar and turbulent flow

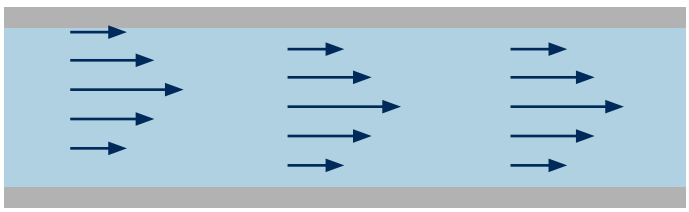
Some flows are soft and even while others are chaotic. Flows that are strongly even with smooth current paths are called laminar. The flow of high viscosity fluids, such as oils at low speeds is a typical example. The intensely chaotic motion of a fluid, usually at high temperatures, characterised fluctuations in speed, is dubbed turbulent. The flow of low viscosity fluids, such as air at high speeds, is typically turbulent. The flow range highly influences the speed of heat transfer and the required pumping power.

The type of flow is characterised by speed, section diameter, and density and viscosity of the product. All these parameters are related and define the well-known Reynolds number, which facilitates the characterization of the flow.

Turbulent flow



Laminar flow

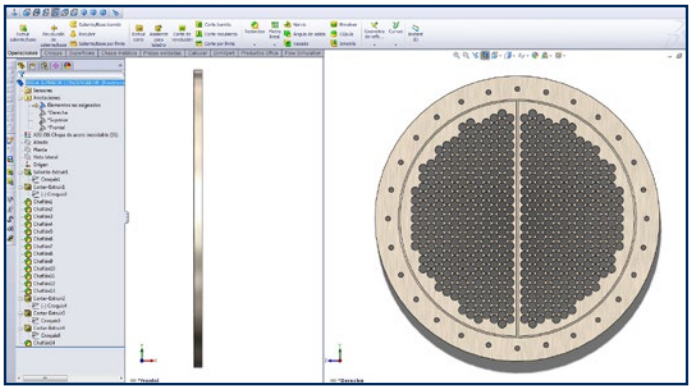


Corrugation

The efficiency of heat exchange is highly improved when the heat is transferred by forced convection, in other words, by using a turbulent process.

Corrugated pipes break the laminar flow, inducing turbulence in the product, and increasing the speed of heat transfer in relation to the laminar flow.

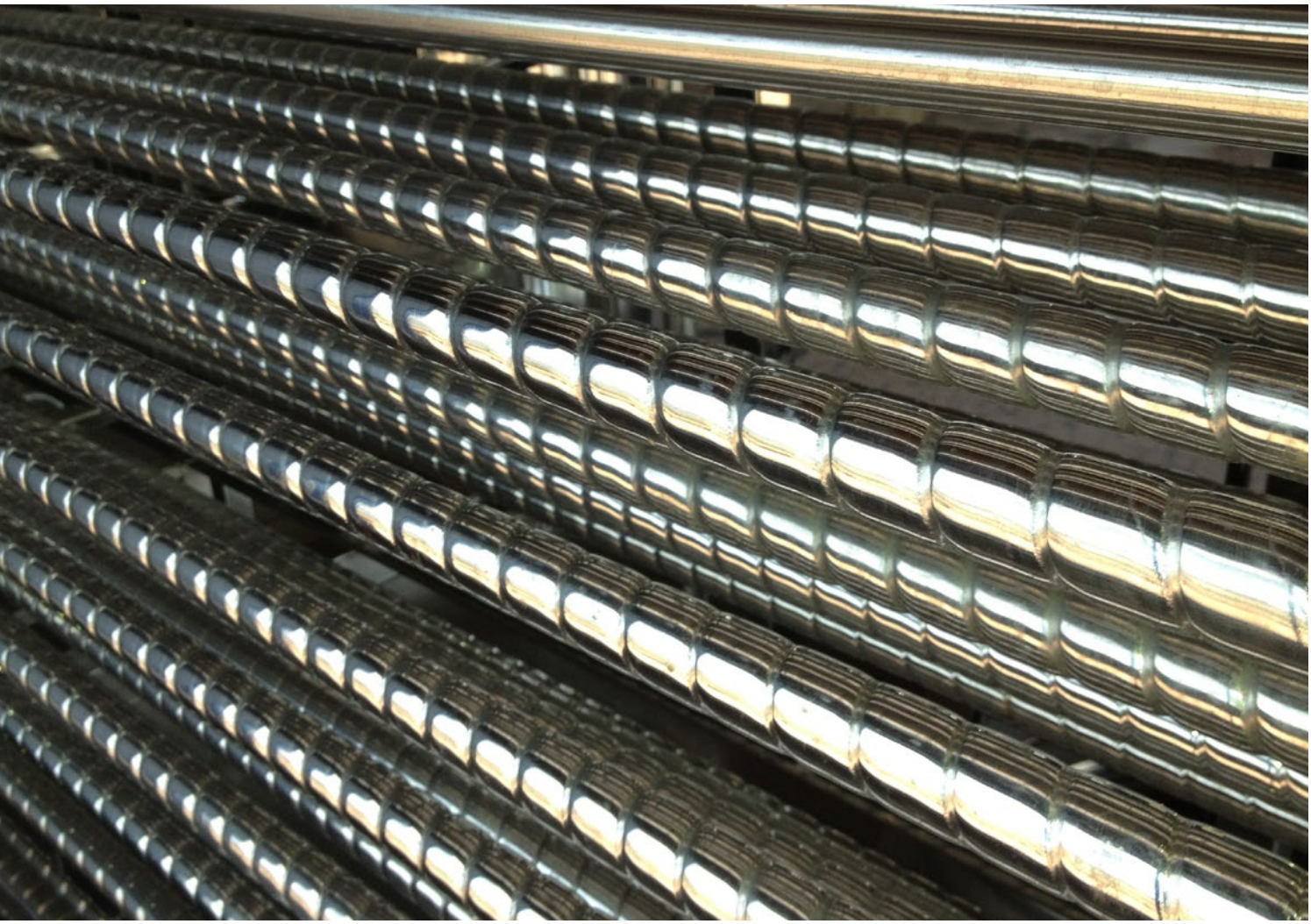
Design

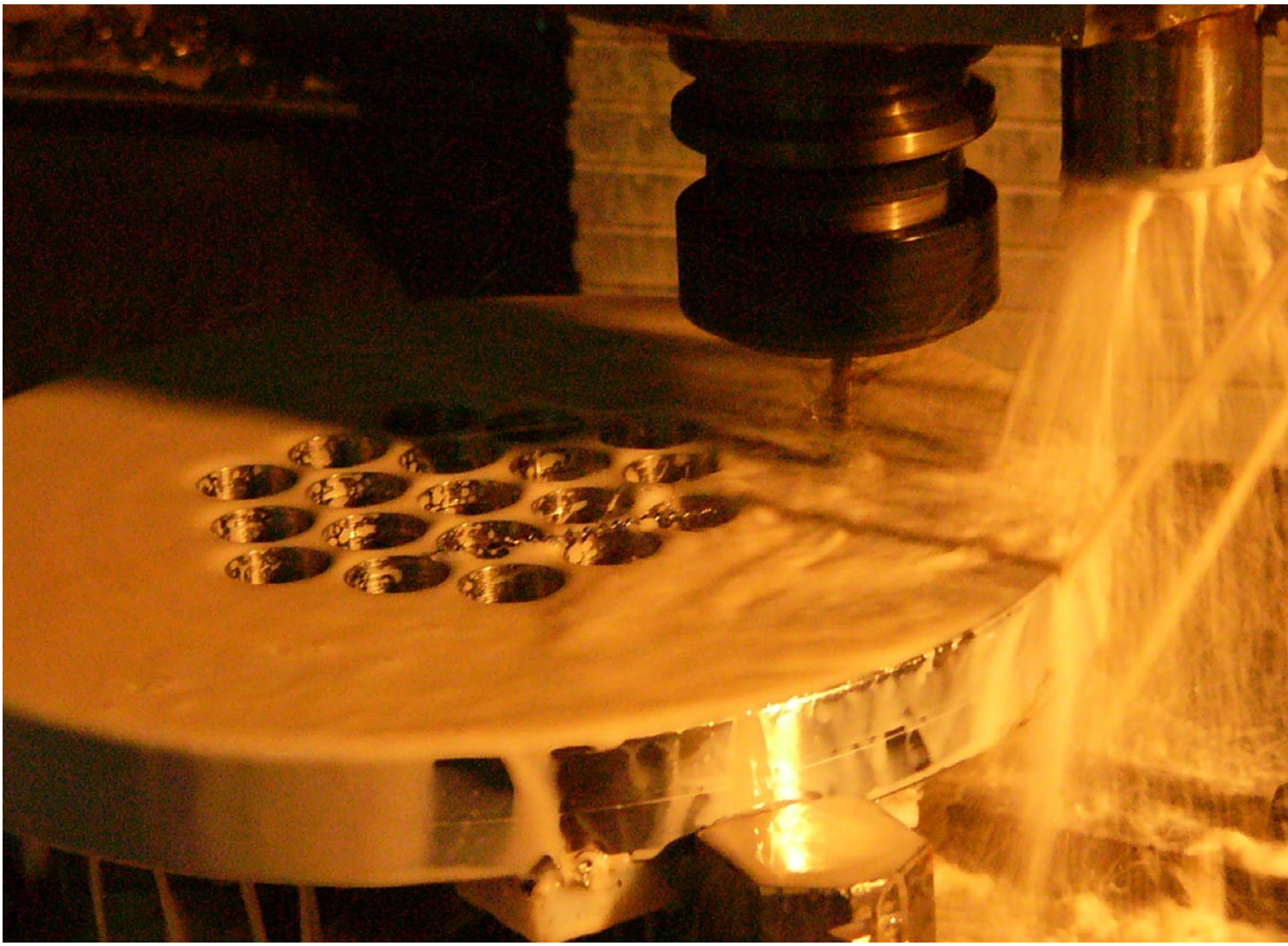


Gémina is at the forefront of the latest technological advances in the fields of mechanics and heat exchange processes. Our heat exchangers are specially designed for food processing applications, such as pasteurisation, freezing and heating, or general cooling of juices, dairy drinks, beers, viscous products, as well as services.

Engineers at Gémina study and design each new heat exchanger based on the requirements for each application using the latest industry software.

Each project application comprises a detailed analysis of the specific requirements demanded by our clients, putting at their disposition all the required information.





Manufacture

Gémina uses advanced equipment for joining, forming, cutting and mechanising that guarantee the perfect overlap between design and manufacture, also thanks to the use of the CAD-CAM system, further guaranteeing the excellent quality of our heat exchangers.

The manufacturing process is carried out to the highest quality standards.

All exchangers are CE certified, and the materials they are built with are FDA approved.

Additionally, all manufacturing processes comply with several international standards such as FBR, EHEDG, 3 A, etc.

Materials

All heat exchangers are a made using AISI 304 and AISI 316 steel. Welding materials are made with EPDM, VITON, PTFE, among others.

Accessories

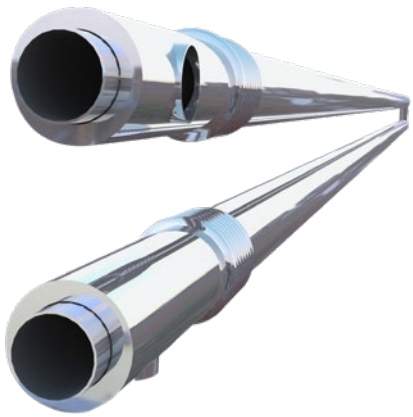
Accessories can be soldered, screwed in or made up of clamps (high and low pressure), flanges, aseptic flanges and hygienic models.

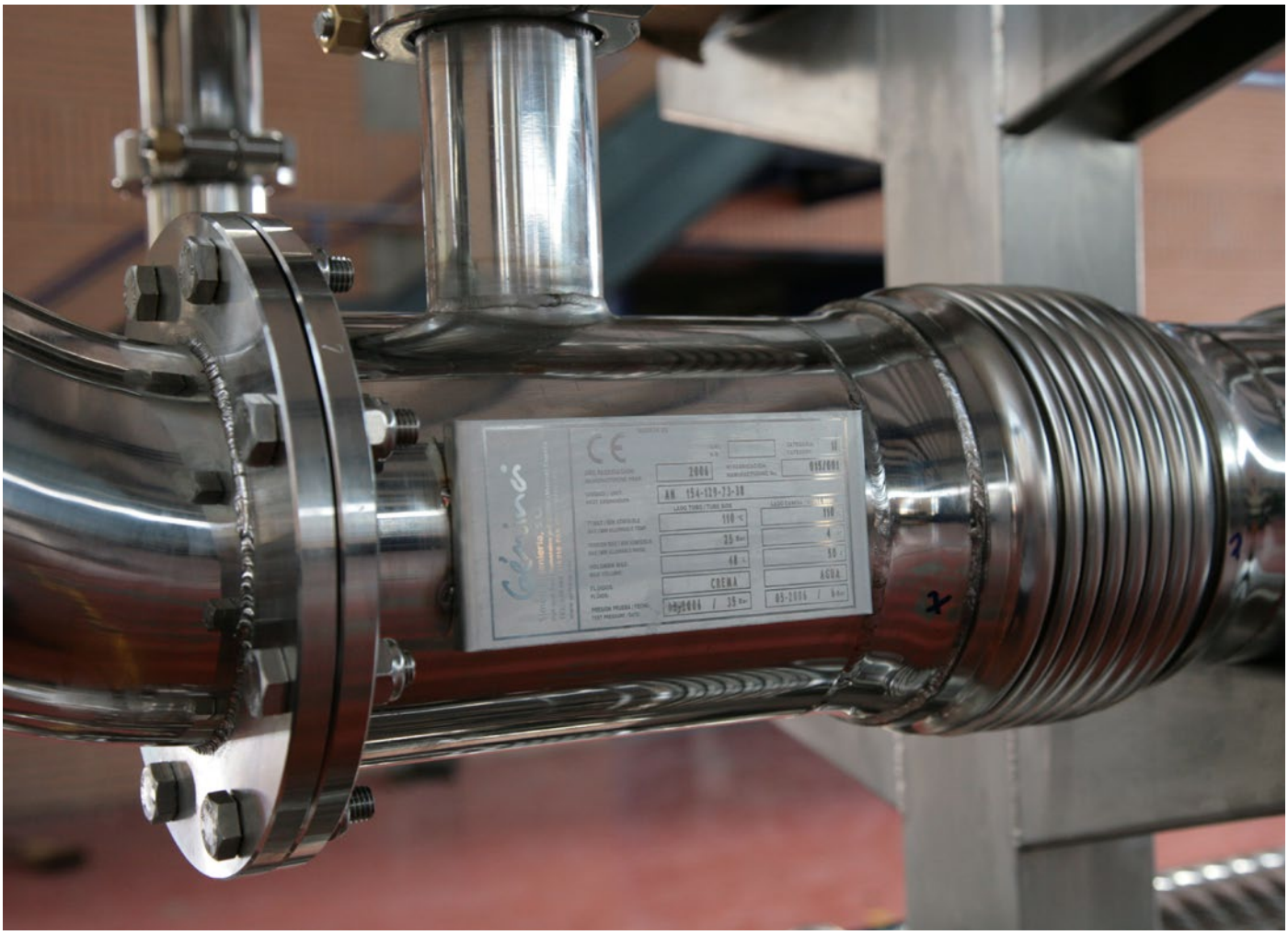
SINGLE TUBE HEAT EXCHANGERS

Applications

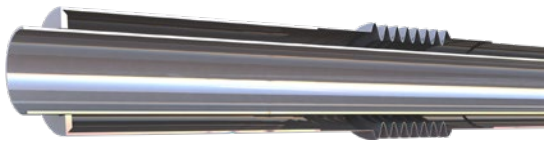
Ideal for products with big or medium sized particles, fibres and strips.
These are generally used in:

- Pasteurisation.
- Heat recovery.
- High pressure, heat, and fouling processes.
- Residual water treatment processes.
- Pilot and test plants.
- Fusion and defrosting treatments.



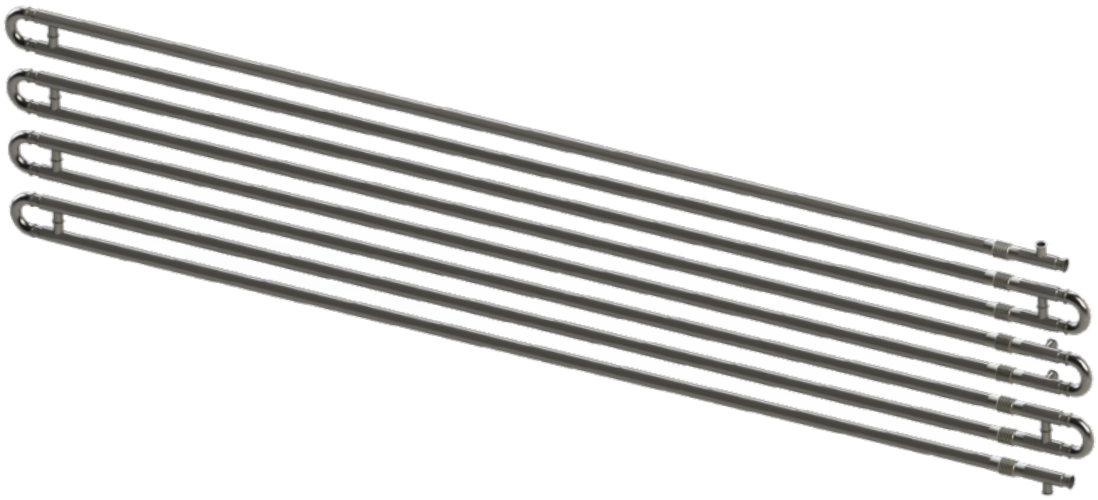


It is ideal for particulate products such as sauces, soups, tomatoes, chopped tomatoes, cubed fruit and meat, smashed grape must, frozen pulp and juices, de-frosting of fruit and dairy concentrates, butter, aseptic processes for fruit yogurt, orange slices and pet food. They can also be used as fruit cookers in processes of enzyme deactivation, and in other sectors such as chemical, textile, cosmetics and pharmaceutical industries.



Design

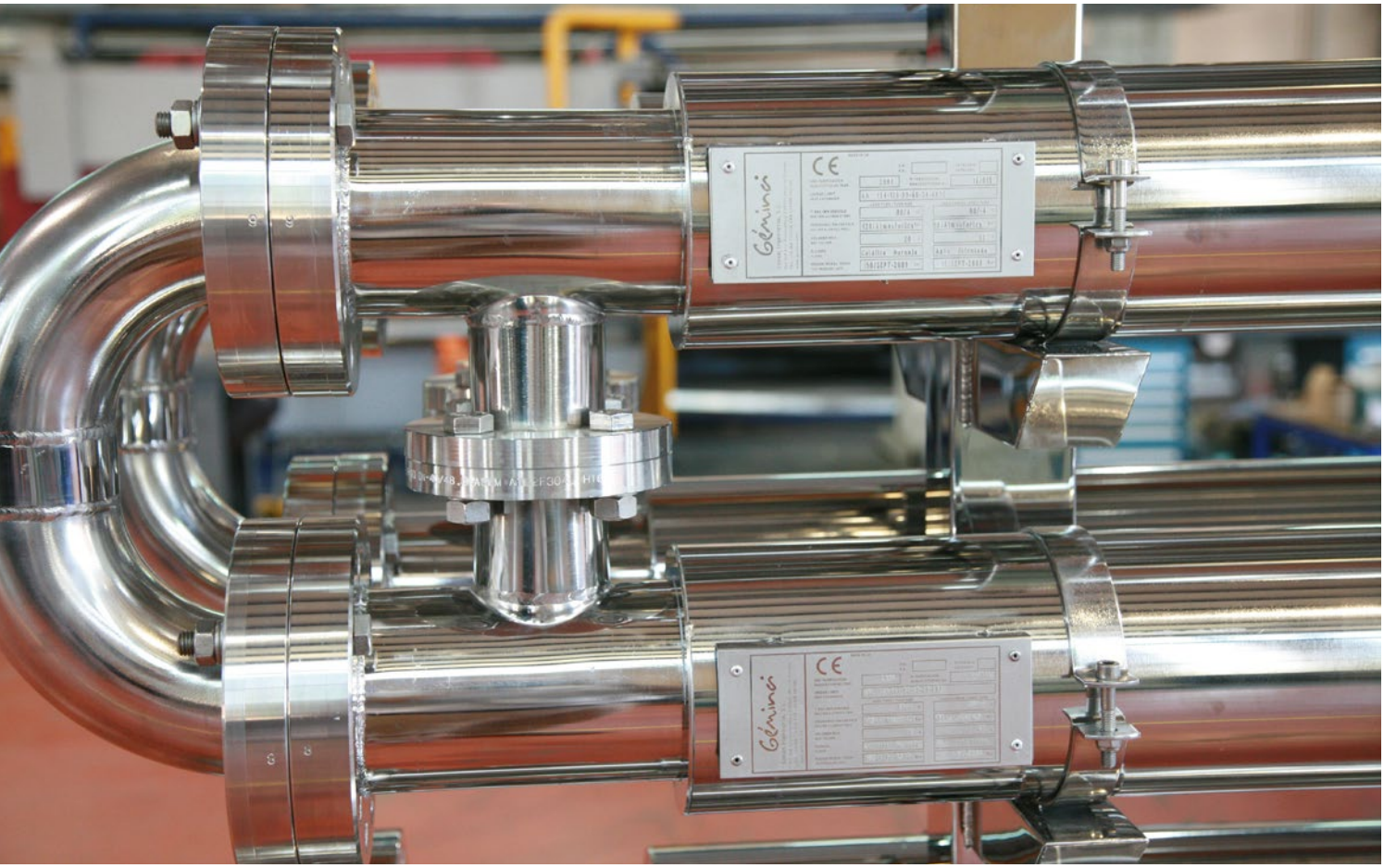
The design of heat exchangers is very simple, it is based on two concentric tubes.



Single tube heat exchangers models

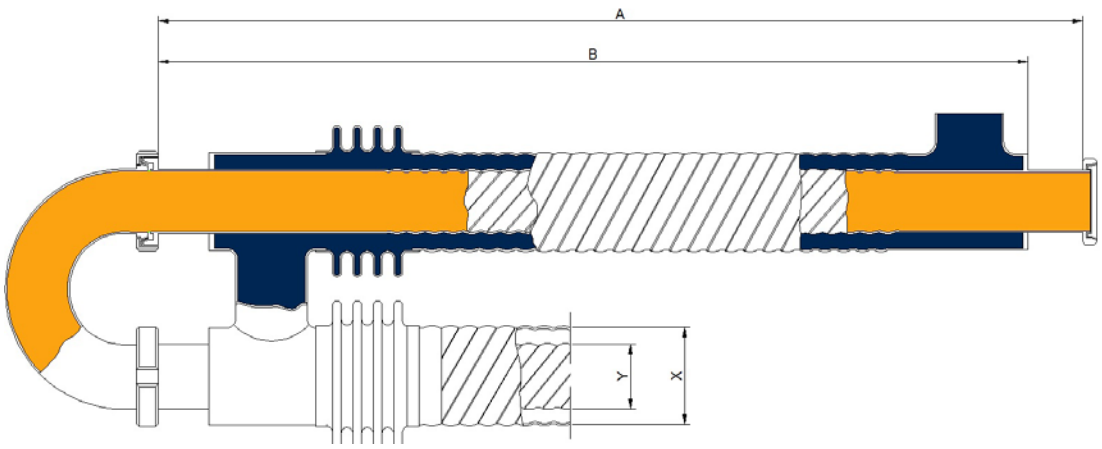
MODELS	A [mm]		B [mm]		AREA [m²]		FLOW [m³/h] (V=1m/s)	
x - y	*3000 mm*	*6000 mm*	*3000 mm*	*6000 mm*	*3000 mm*	*6000 mm*	*SERVICIOS*	*PRODUCTO*
1,5" - 1"	2925	5925	2845	5845	0,2	0,5	1,7	1,5
2" - 1"	"	"	"	"	0,2	0,5	4,7	1,5
2" - 1,5"	"	"	"	"	0,4	0,7	2,4	3,5
2,5" - 1,5"	"	"	"	"	0,4	0,7	6,3	3,5
2,5" - 2"	"	"	"	"	0,5	1	3,1	6,5
3" - 2"	"	"	"	"	0,5	1	7,9	6,5
3" - 2,5"	"	"	"	"	0,6	1,2	3,7	10,4
3,5" - 2"	"	"	"	"	0,5	1	13,1	6,5
3,5" - 2,5"	"	"	"	"	0,6	1,2	9	10,4
3,5" - 3"	"	"	"	"	0,7	1,4	4	15,1
4" - 2"	"	"	"	"	0,5	1	19,6	6,5
4" - 2,5"	"	"	"	"	0,6	1,2	15,5	10,4
4" - 3"	"	"	"	"	0,7	1,4	10,5	15,1
4" - 3,5"	"	"	"	"	0,8	1,7	4,6	20,4
4,5" - 2"	"	"	"	"	0,5	1	27,1	6,5
4,5" - 2,5"	"	"	"	"	0,6	1,2	23	10,4
4,5" - 3"	"	"	"	"	0,7	1,4	18	15,1
4,5" - 3,5"	"	"	"	"	0,8	1,7	12,1	20,4
5" - 2,5"	"	"	"	"	0,6	1,2	32,8	10,4
5" - 3"	"	"	"	"	0,7	1,4	27,8	15,1
5" - 3,5"	"	"	"	"	0,8	1,7	21,8	20,4
5" - 4"	"	"	"	"	1	1,9	15	26,9
5,5" - 3"	"	"	"	"	0,7	1,4	35,6	15,1
5,5" - 3,5"	"	"	"	"	0,8	1,7	29,7	20,4
5,5" - 4"	"	"	"	"	1	1,9	22,9	26,9
5,5" - 4,5"	"	"	"	"	1,1	2,2	15,1	34,4
6" - 3,5"	"	"	"	"	0,8	1,7	41,3	20,4
6" - 4"	"	"	"	"	1	1,9	34,4	26,9
6" - 4,5"	"	"	"	"	1,1	2,2	26,7	34,4

Specifications, values and dimensions are subject to small modifications without the need for advance notice. Products can be manufactured in other sizes and/or specifications on customer's request and consultations with the technical department.



Advantages

- Short processing time processes thanks to corrugation and its high thermal transfer coefficient.
- Homogenous thermal process.
- Low fouling due to the self-cleaning effect of high turbulence inside a corrugated tube.
- Hygienic design, there are no areas or dentures where micro-organism could lodge.
- Low corrugated surface Ra≤ 0.8 mm or less depending on type of finish (plug drawn, bright finish, electronic polishing, etc.).
- Prolonged functioning periods between stops without the need to clean. Effective C.I.P. cleaning cycles thanks to the reduction of dead areas that facilitate product build-up.
- Cost effective and versatile. The same heat exchanger can work with an ample range of products.
- Easy to inspect.
- The absence of contact point prevents products from burning.
- High temperatures and pressure achievable thanks to the absence of joints.
- Compact.
- No spare replacement parts needed.
- Low maintenance costs.



MULTITUBULAR OR PYROTUBULAR HEAT EXCHANGERS

Applications

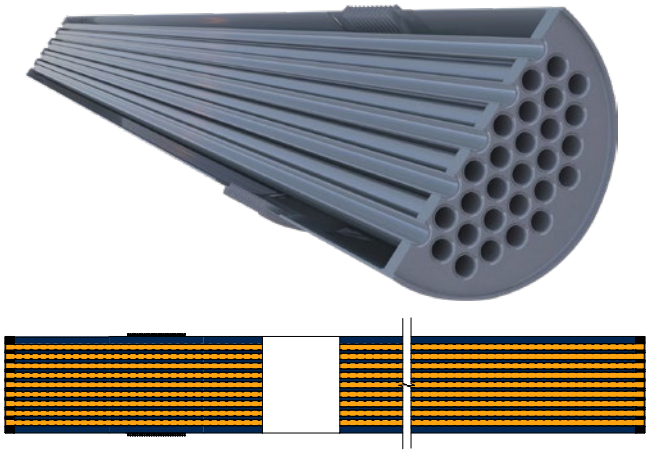
Ideal for high or medium viscosity products with low or high pH; liquids with small particles destined for the food, chemical, cosmetic, and pharmaceutical industry. They are mainly used in applications such as:

- UHT pasteurising processes.
- Product-to-product or water-to-product heat recovery.
- High temperature and/or pressure processes.
- Food transformation.

Ideal for use with products such as: Dairy products from concentrate, Creams, Fermented dairy drinks, Flavoured dairy drinks, Dairy products (yogurt, cream), Liquid baby food, Purées, Ice cream, Soups, Pulps, Solutions, Protein based dinks, Juices, Fruit and vegetable purées,Juices with or without bits, Ketchup, Soy products, Energy drinks, Beer, Alcoholic drinks, Oils,Chocolate, Demineralised water, Coffee extract, Syrups.

Design

Its design is characterized by the arrangement of several tubes within an outer tube or 'shell', with one or several passages in the product's canal.



Advantages

- Short processing time processes thanks to corrugation and its high thermal transfer coefficient.
- Homogeneous thermal process (no distribution problems as in those in plate exchangers).
- Low fouling due to the self-cleaning effect of high turbulence inside a corrugated tube.
- Low corrugated surface Ra≤ 0.8 mm or less depending on type of finish (plug drawn, bright finish, electronic polishing, etc.).
- Prolonged functioning periods between stops without the need to clean. Effective C.I.P. cleaning cycles thanks to the reduction of dead areas that facilitate product build-up.
- High security is aseptic processes.
- Cost effective and versatile. The same heat exchanger can work with an ample range of products.
- High quality of thermal treatments thanks to high speeds, short heat up times, homogeneous distribution and ability to withstand high pressure.
- The absence of contact point prevents products from burning.
- Modular structure. Capacity can be increased at any moment.
- Easy to inspect and disassemble.
- Low maintenance costs.
- Few replacement parts needed.

Pyrotubular heat exchangers

MODELS	A [mm]		AREA [m²]		FLOW [m³/h] (V=1m/s)		DIAMETER		TUBES INT.
	3 m	*6 m*	*3 m*	*6 m*	*SHELL*	*TUBES*	*SHELL [Inch.]*	*TUBES [mm]*	
3"	2735	5735	1,1	2,1	10,1	3,9	3	16	7
			1,2	2,4	8,7	5,1	3	18	7
3,5"	2566	5566	1,1	2,1	15,3	3,9	3,5	16	7
			1,2	2,4	14	5,1	3,5	18	7
			1,3	2,6	12,5	6,4	3,5	20	7
			1,5	2,9	10,8	7,9	3,5	22	7
4"	2540	5540	1,3	2,6	19	6,4	4	20	7
			1,5	2,9	17,4	7,9	4	22	7
			1,6	3,3	14,6	10,5	4	25	7
4,5"	2540	5540	1,6	3,3	22	10,5	4,5	25	7
			1,8	3,7	18,9	12,4	4,5	28	7
			2,9	5,7	20,6	10,5	4,5	16	19
5"	2515	5515	1,8	3,7	28,7	12,4	5	28	7
			2,2	4,4	22,6	17,8	5	33	7
			3,2	6,4	26,8	13,8	5	18	19
			3,6	7,2	22,7	17,4	5	20	19
5,5"	2490	5490	2,2	4,4	30,5	17,8	5,5	33	7
			2,5	5	23,5	24,2	5,5	38	7
			3,2	6,4	34,7	13,8	5,5	18	19
			3,6	7,2	30,6	17,4	5,5	20	19
			3,9	7,9	26,1	21,5	5,5	22	19
6"	2490	5490	2,5	5	35	24,2	6	38	7
			3,6	7,2	42,1	17,4	6	20	19
			3,9	7,9	37,6	21,5	6	22	19
			4,5	9	30	28,4	6	25	19

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ANNULAR HEAT TRANSFER UNITS

Aplicaciones

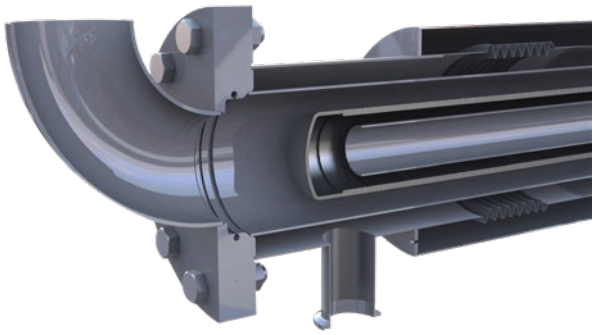
Ideal for products of medium and high viscosity at high or low pH, with laminar flow tendency, that transfer heat through conduction and not convection, as well as products with a granular texture and non-Newtonian fluids, such as:

- Pasteurisation.
- High pressure (300 bar) and/or temperature processes.
- Near-solidification point cooling treatments.
- Gelification.

Ideal for products such as: fruit pulps, tomato paste, banana paste, mash, honey, yogurt, chocolate, dressing and starch-based sauces, butter, cocoa butter, and peanuts, toffee, pudding, egg-based products, mix for ice cream, baby food, marmalade and jams, lecitins, collagen, gelifications, chemical or pharmaceutical products, and textiles...

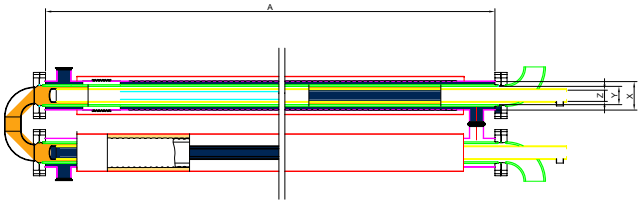
Design

Its design has three concentric tubes. Given this layout the product is exposed to and extensive surface of heat transfer since heat is exchanged both through the inner and outer parts.



Advantages

- Short thermal treatment periods thanks to corrugation and an increased heat exchange surface.
- Working pressure up to 300 bars.
- Working temperatures up to 180oC.
- Different annular spacing to optimize speed at different flow rates.
- High security in aseptic processes.
- Continuous double annular flow at bends.
- The absence of contact points that prevents product from burning.
- Low corrugated surface (Ra≤0.8mm or less) depending on the type of finish (plug drawn, bright finish, etc.).
- Homogeneous thermal treatment due to its mixing capacity.
- Ease of assembly.
- Versatile and cost effective due to its flexibility of use with other products.
- Low fouling due to the self-cleaning effect of high turbulence inside a corrugated tube.
- Prolonged functioning periods between stops without the need to clean. Effective C.I.P. cleaning cycles thanks to the reduction of dead areas that facilitate product build-up.
- Designed to provide minimum product stops for highly viscous products.
- Easy to expand.
- Few replacement parts needed.
- Low maintenance costs.



Annular transfer models

MODELS	A [mm]		AREA [m²]		FLOW [m³/h] (V=1m/s)		DIAMETERS		
	3 m	*6 m*	*3 m*	*6 m*	*SERVICES*	*PRODUCT*	*X*	*Y*	*Z*
2,5"-2"-1,5"	2934	5934	0,8	1,7	6,5	2,4	63,5	50,8	38,1
3"-2,5"-1,5"	2934	5934	1	1,9	7,2	6,3	76,2	63,5	38,1
3"-2,5"-2"			1,1	2,2	10,2	3,1			50,8
3,5"-3"-1,5"	2934	5934	1,1	2,2	7,4	11,1	88,9	76,2	38,1
3,5"-3"-2"			1,2	2,4	10,4	7,9			50,8
3,5"-3"-2,5"			1,3	2,6	14,3	3,7			63,5
4"-3,5"-2"	2934	5934	1,3	2,6	11	13,1	101,6	88,9	50,8
4"-3,5"-2,5"			1,4	2,9	14,9	9			63,5
4"-3,5"-3"			1,6	3,1	8,3	4			76,2
4,5"-3,5"-2"	2934	5934	1,3	2,6	18,5	13,1	114,3	88,9	50,8
4,5"-3,5"-2,5"			1,4	2,9	22,4	9			63,5
4,5"-3,5"-3"			1,6	3,1	19,9	4			76,2
5"-4"-2"	2934	5934	1,4	2,9	21,5	19,6	129	101,6	50,8
5"-4"-2,5"			1,6	3,1	25,3	15,5			63,5
5"-4"-3"			1,7	3,4	30,1	10,5			76,2
5"-4"-3,5"			1,8	3,6	24	4,6			88,9
5,5"-4,5"-2,5"	2934	5934	1,7	3,4	25,5	23	139,7	114,3	63,5
5,5"-4,5"-3"			1,8	3,6	30,3	18			76,2
5,5"-4,5"-3,5"			1,9	3,8	24,1	12,1			88,9
5,5"-4,5"-4"			2	4,1	25,6	5,2			101,6
6"-5"-3"	2934	5934	1,9	3,9	31,7	27,8	154	129	76,2
6"-5"-3,5"			2,1	4,1	25,5	21,8			88,9
6"-5"-4"			2,2	4,3	27,1	15			101,6
6"-5"-4,5"			2,3	4,6	28,6	7,2			114,3

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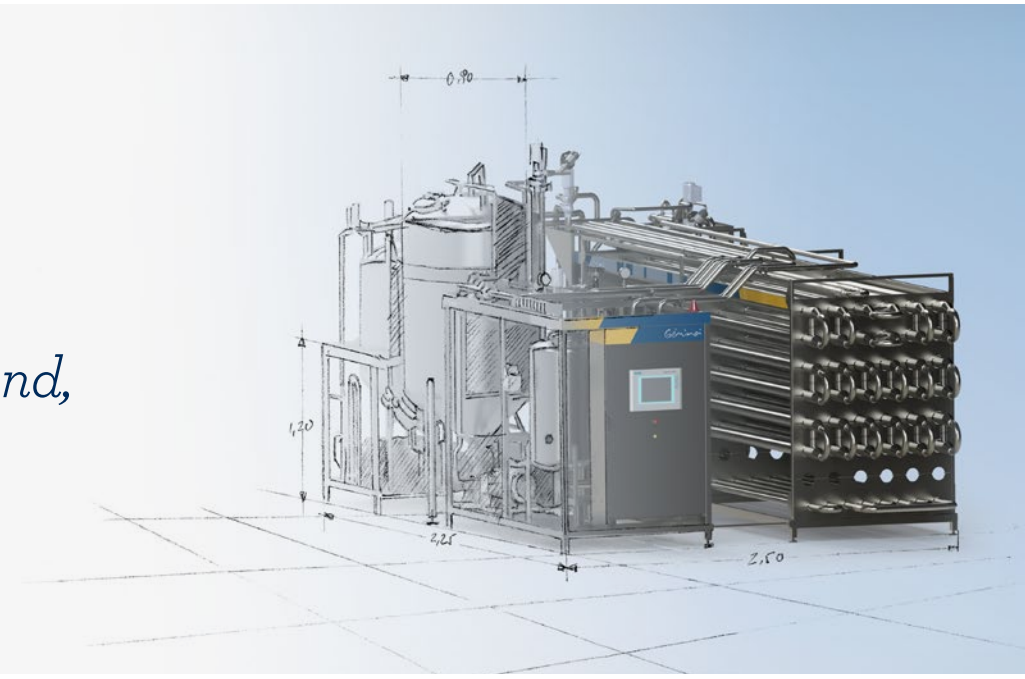
Our company

Gémina©
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.

Gémina©

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