PF10 Impianti Industriali

Low Consumption Vacuum Evaporators and Concentration units.

PF10
Impianti Industriali

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emmecom® Emmecom Group

PF10 is a company

that has been combining development and experience since 1984, in order to realize filtering, fluid and gas treatment plants. PF10 produces also plants for renewable energy and pumping units for fire systems.

The Vacuum Evaporators and Concetrators department of PF10 develops and projects new and advanced technologies.

PF10 purpose is not only to supply high quality products and services but also to create a partnership with their customers by finding the best and customized solutions to their requests.

PF10 is ISO 9001:2008 certified.

AFAQ ISO 9001 cert. no.38257

What is vacuum evaporation?

The vacuum evaporation is the passage of state from liquid to gas that occurs at a temperature lower than boiling point of atmospheric pressure.

This technique, that grants energy saving, is used to separate an involatile element from a solution, by obtaining deionized water and a concentrate.

Vacuum evaporation plants are used for the concentration of thermolabile solutions or for the treatment of waste water produced by industries during the different stages of the process.

The recovery of important raw materials from waste water, the reduction of disposal costs and the development of ZLD (Zero Liquid Discharge) plants are the main advantages of the vacuum evaporation.

The advantages of vacuum evaporation

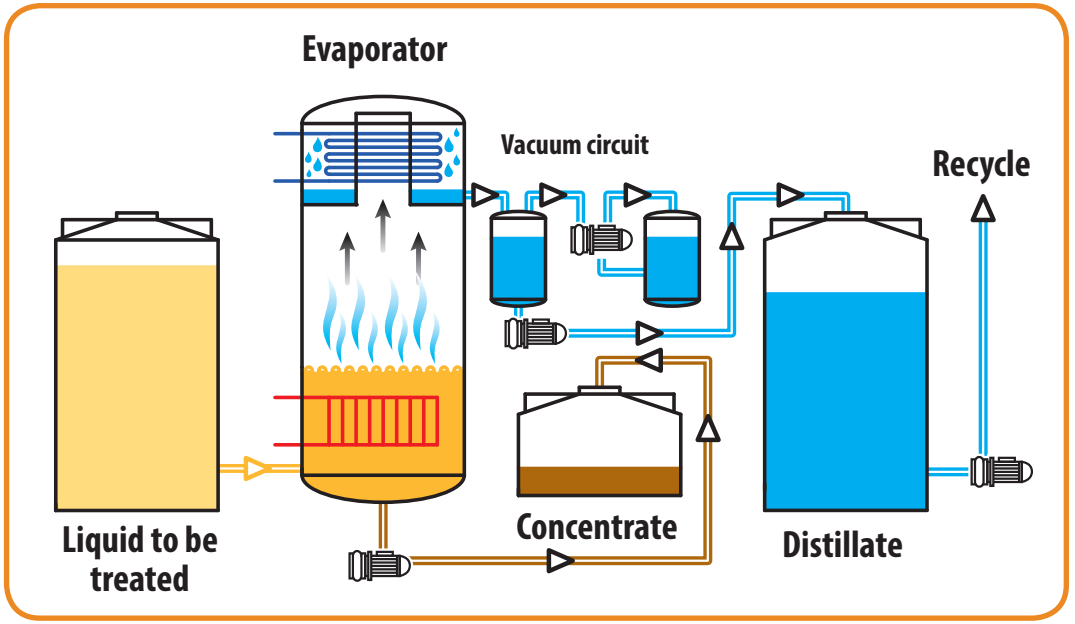
The use of the vacuum evaporation technique has shown several advantages among different industrial fields.

For instance, it is possible to **reduce 95% of disposal costs** and to recycle diluted raw materials, like mineral salt, during the processes of thermal treatment of metals, or galvanic baths from chrome, nickel and copper washings. It is also possible to concentrate substances of pharmaceutical synthesis, food stocks and essences.

The application of the vacuum evaporation technique on ecological platforms grants the treatment of a wide range of waste fluids, also high polluting ones, that cannot normally be treated with the usual purification techniques, like the biological and chemical ones.

The aim is to produce evaporators with the following features:

- low energy consumption
- high quality of the distillate that can be recycled or used as discharge water
- obtain highly concentrated substances
- work atomatically without supervision
- easy maintenance
- integration with already existing systems
- complementary with other process
- allow the development of ZLD
- corrosion-resistant
- low temperature evaporation



Scheme of the system

Application fields

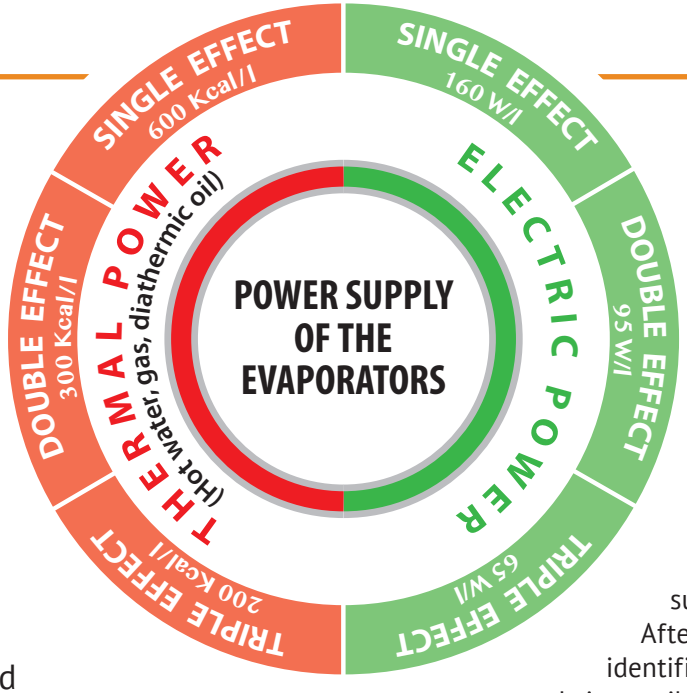
Vacuum evaporation is a concentration technique that can be employed in all those industrial fields, where the aim is separating a solvent, usually water to be recycled during the production process, from a solute with a higher boiling point.
Vacuum evaporation plants represent the most advanced systems used to solve the problems of raw materials recovery and treatment of polluting fluids.

The vacuum evaporation is used to concentrate waste water in the following industries:

- **ELECTROPLATING**: eluted fluids of resins plants, fluids from chrome, nickel and copper washing
- **MECHANICAL**: oily emulsions, washing fluids
- **DIE-CASTING**: glycol fluids, lubricants and cooling fluids
- **PAINTING WASTE WATER**: fluids from washing of painted components
- **GARBAGE FLUIDS**
- **FLUIDS FROM BIOGAS PLANTS**
- **REVERSE OSMOSIS** (salines)
- **ZLD**: total recycle of waste water

Moreover, this technique can also be applied to **THERMOLABILE elements** like:

- herbal extracts
- wine must



Plant types

The nature and quantity of the treated product determine the type of unit to be developed.
Two different types of model are manufactured:
Electric powered model: from 10 to 4.000 l/h (from 240 to 100.000 l/day).
Thermal powered model: from 200 to 10.000 l/h (from 4.800 to 240.000 l/day).
The choice of the most suitable evaporator is made considering several factors. The nature of the product to be treated determines the version (with submerged exchanger, forced circulation exchanger, scraped exchanger, jacked exchanger...) and the most suitable construction materials.
Afterwards, the most suitable power supply has to be identified by evaluating costs and availability of heat sources.
It is possible to choose between electric supply, through a heat pump system of simple installation, and thermal supply by using warm water, steam or by exploiting the heat generated by the production process.
Both systems can be realized in single, double, triple effect version.

Construction materials

The high quality of plants is granted by the employment of the most suitable materials and components. The choice of the construction materials is one of the essential phase of the project.
Stainless steel **AISI 316 L**, is used for plants with law risk of corrosion, while **DUPLEX, SUPER DUPLEX, SILICON CARBIDE, GRAPHITE, TITANIUM AND FLUOROCARBON RESINS** are used for the treatment of more corrosive components.

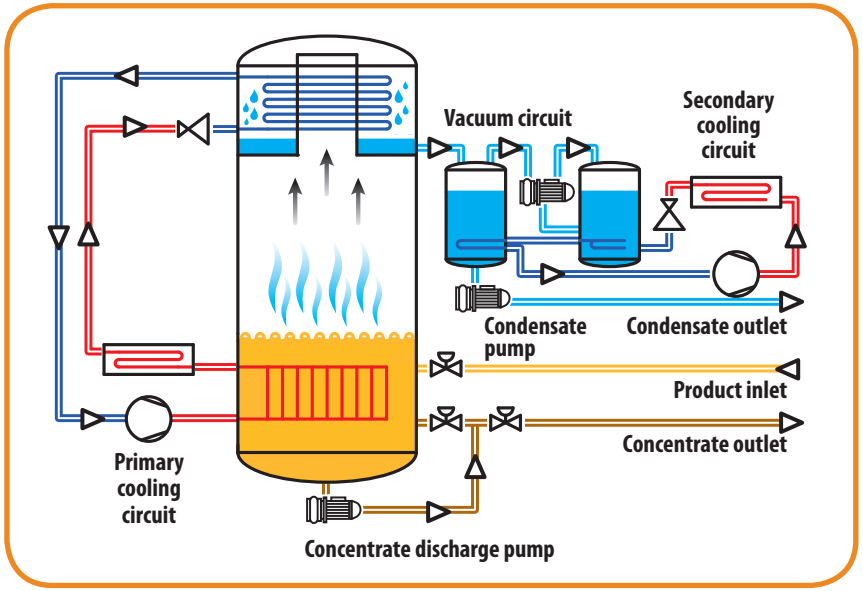
ETV SERIES

The ETV model is a vacuum evaporator/concentrator with **heat exchanger** submerged in the fluid to be processed or, on customer's demand, with **an outer shell and tubes exchanger.**
Moreover, PF10 is the sole manufacturer of **exchanger with submerged plates**.
All PF10 evaporation plants can be manufactured in AISI 316 (std. version), duplex, super duplex, according to the characteristics of the fluid to be treated.
All PF10 vacuum evaporators have the following features:

- Automatic operation.
- Concentrate discharge by pump with automatic frequency can be set to PLC or by consent received from densimeter, which can be provided the evaporator, without stopping the operation of evaporation and without losing vacuum.
- Possibility of recycling the processed fluid
- Automatic antifoam system.
- Sightglass (with cleaning system) to control the contents of the tank.
- Chance of taking samples of the distillate and concentrate without deactivation of the plant.

ETC SERIES

The ETC model has been developed for the treatment of aggressive fluids.
The ETC evaporator is similar to the ETV model but all the parts in contact with the fluid are made with special anticorrosion materials, **like titanium, silicon carbide, graphite.** The ETC model is used, for example, for the treatment of washing water used in the chrome plating process.



TECHNICAL DATA - SINGLE EFFECT HEAT PUMP

MODEL l/h	ETV 25	ETV 50	ETV 75	ETV 100	ETV 150	ETV 200	ETV 300	ETV 400	ETV 500	ETV 1.000	ETV 2.000
Distillate l/24h	600	1.200	1.800	2.400	3.600	4.800	7.200	9.600	12.000	24.000	48.000
Installed power kW	5	10	14	20	30	40	60	80	100	200	400
Absorbed power kW	4	8	12	16	24	32	48	64	80	160	320
Dimensions a x b x h (cm)	200x80x220	250x110x220	250x110x250	270x125x270	300x125x270	300x150x285	350x150x350	450x170x400	450x170x400	500x220x450	600x480x550
											1200x240x550

Double and triple effect
evaporators with heat pump

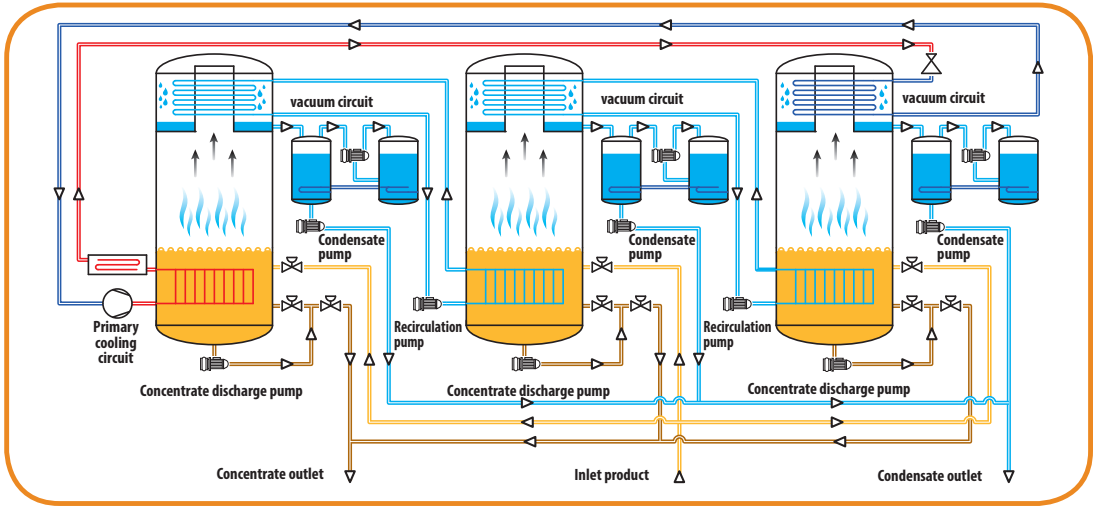
When saving energy is important

EDH SERIES
DOUBLE EFFECT HEAT PUMP

The EDH model is an evaporator of high energy efficiency. The power is supplied through a heat pump that employs a particular freon and exploits the thermal power of the fluid, evaporated during the first stage of evaporation, to supply a second stage of evaporation. This model allows to **reduce the electric consumption of 40%** than the similar single effect ETV model. The construction materials of this evaporator are the same as those used for the ETV and ETC models.

ETH SERIES TRIPLE EFFECT HEAT PUMP

The ETH evaporator is an evolution of the ETC model. Not only the thermal power of the liquid, sublimated during the first stage of evaporation, is used to supply a second evaporation phase, but a third stage of evaporation has been added to improve the energy efficiency. This model allows to **reduce the energy consumption of 60%** in comparison with the single effect ETV model.



TECHNICAL DATA - ETH SERIES TRIPLE EFFECT HEAT PUMP

MODEL l/h	ETH 1000	ETH 2000	ETH 2500	ETH 3000	ETH 4000
Distillate l/24h	24.000	48.000	60.000	72.000	96.000
Installed power kW	82	164	200	245	320
Absorbed power kW	65	130	162	195	260
Dimensions a x b x h (cm)	450X240X350	600X400X400	600X500X450	600X600X500	600X600X500

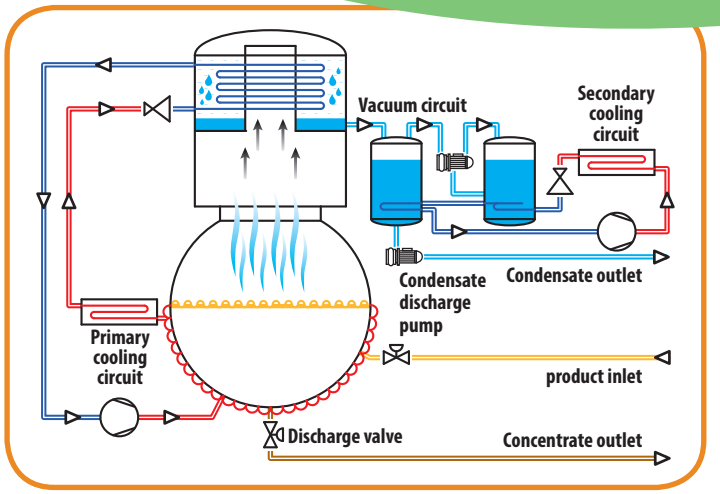
TECHNICAL DATA - EDH SERIES - DOUBLE EFFECT HEAT PUMP

MODEL l/h	EDH 300	EDH 400	EDH 500	EDH 600	EDH 800	EDH 1000	EDH 2000	EDH 2500	EDH 3000	EDH 4000
Distillate l/24h	7.200	9.600	12.000	14.400	19.200	24.000	48.000	60.000	72.000	96.000
Installed power kW	36	48	60	72	95	120	240	300	360	480
Absorbed power kW	28,5	38	47,5	57	76	95	190	237	285	380
Dimensions a x b x h (cm)	240x280x280	240x320x300	240x350x320	240x400x350	240x500x350	240x500x380	240x900x450	240x900x450	240x1200x500	480x900x550
							480x500x450	480x500x450	480x600x500	

Highly concentrated solutions

ETD SERIES

The ETD model takes advantage of the crystal precipitation when the solute overcomes the solubility limit.
In order to obtain these outcomes, the plant has no submerged heat exchanger, but uses jacked exchangers to heat the fluids.
The boiling tank is horizontal and the concentrate can reach the consistency of mud.
The discharge occurs manually through the opening of the front hatchway.

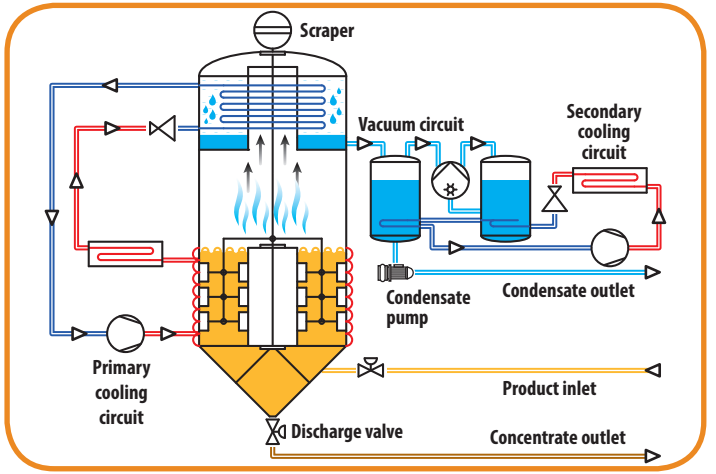


TECHNICAL DATA - ETD SERIES

MODEL l/h	ETD 5	ETD 10	ETD 15	ETD 20	ETD 30	ETD 40
Distillate l/24h	120	240	360	480	720	960
Installed power kW	2,5	4	5	7	9,5	12
Absorbed power kW	1,5	2,5	3,5	5	7,5	10
Dimensions a x b x h (cm)	70x120x170	80x150x180	80x200x200	80x220x220	100x250x230	120x250x300
Volume of boiling chamber	25	50	80	125	200	300

ETR SERIES WITH SCRAPER

The ETR model has been developed to obtain highly concentrated waste and to treat encrusting solutions. The employment of an automatic scraper, that keeps the exchange surfaces clean, allows to obtain thicker concentrates than the ones obtained through other evaporation techniques. The concentrate can be discharged both trough a membrane pump and through a butterfly valve.



TECHNICAL DATA - ETR SERIES

MODEL l/h	ETR 10	ETR 20	ETR 30	ETR 40	ETR 60	ETR 80	ETR 100	ETR 125	ETR 150
Distillate l/24h	240	480	720	960	1.440	2.000	2.400	3.000	3.600
Installed power kW	4	7	10	12	18	24	30	36	43
Absorbed power kW	2,5	5	7,5	10	15	20	25	32	38
Dimensions a x b x h (cm)	70x220x250	80x250x280	80x250x300	110x270x300	120x300x320	120x300x300	150x300x300	170x350x320	170x350x350
Volume of boiling chamber	70	110	140	350	560	350	380	380	450

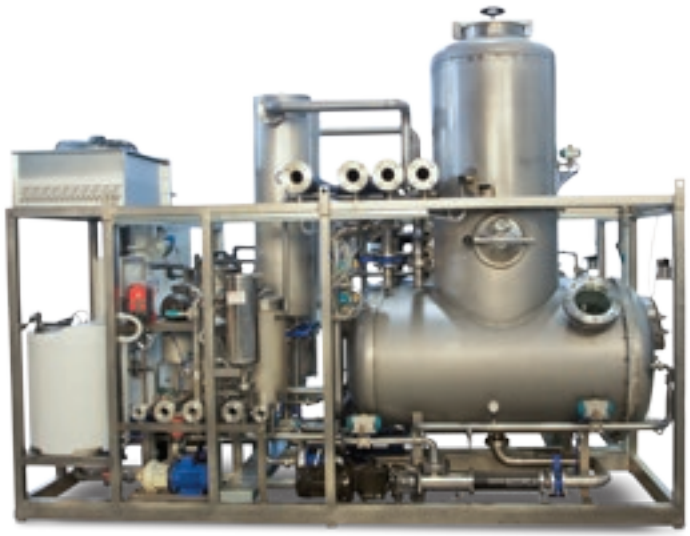
SINGLE EFFECT

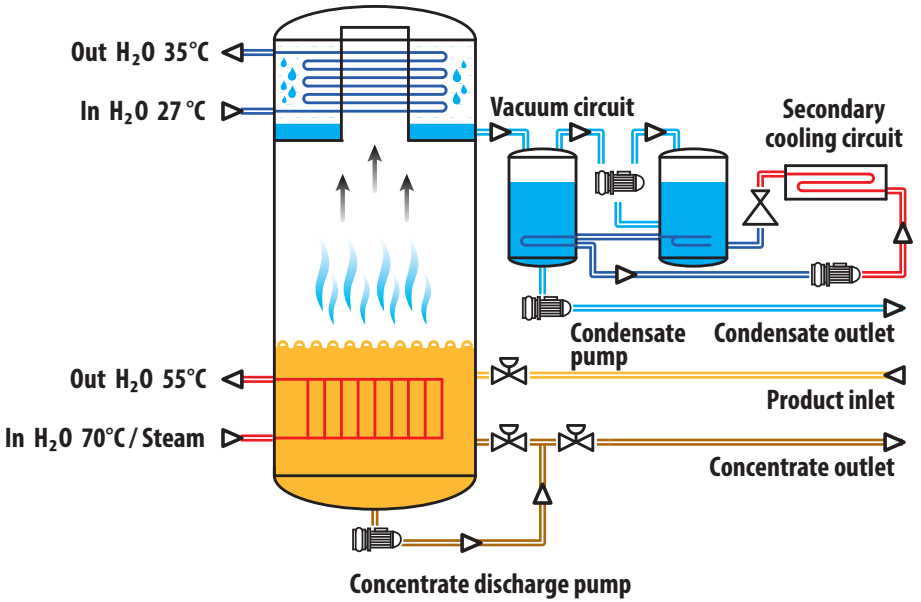
evaporators powered by hot water or steam

When the cost of the plant is essential

ETW ME SERIES – THERMAL POWERED, SINGLE EFFECT EVAPORATORS

The ETW model is a vacuum evaporator/concentrator with **heat exchanger submerged** in the treated fluid or, at customer's request, with **an outer shell and tubes heat exchanger.** Alternatively, PF 10 can install **special submerged plates heat exchangers.**
These vacuum evaporators/concentrators exploit during the evaporation phase the thermal power supplied by hot water or steam and for the condensation phase the one produced by water from closed circuit dry-coolers or evaporation towers.





TECHNICAL DATA - ETW ME SERIES

MODEL l/h	ETW 250 ME	ETW 500 ME	ETW 1000 ME	ETW 1500 ME	ETW 2000 ME	ETW 3000 ME
Distillate l/24h	6.000	12.000	24.000	36.000	48.000	72.000
Installed power kW	9	13	17	19	21	24
Absorbed power kW	8	11	14	16	18	21
Thermal power kW (kcal)	175 (150.000)	350 (300.000)	700 (600.000)	1.050 (900.000)	1400 (1.200.000)	2.100 (1.800.000)
Dimensions a x b x h (cm)	150X300X280	170X350X370	200X400X430	220x500x500	240x600x550	480X600X550

Double or triple effect

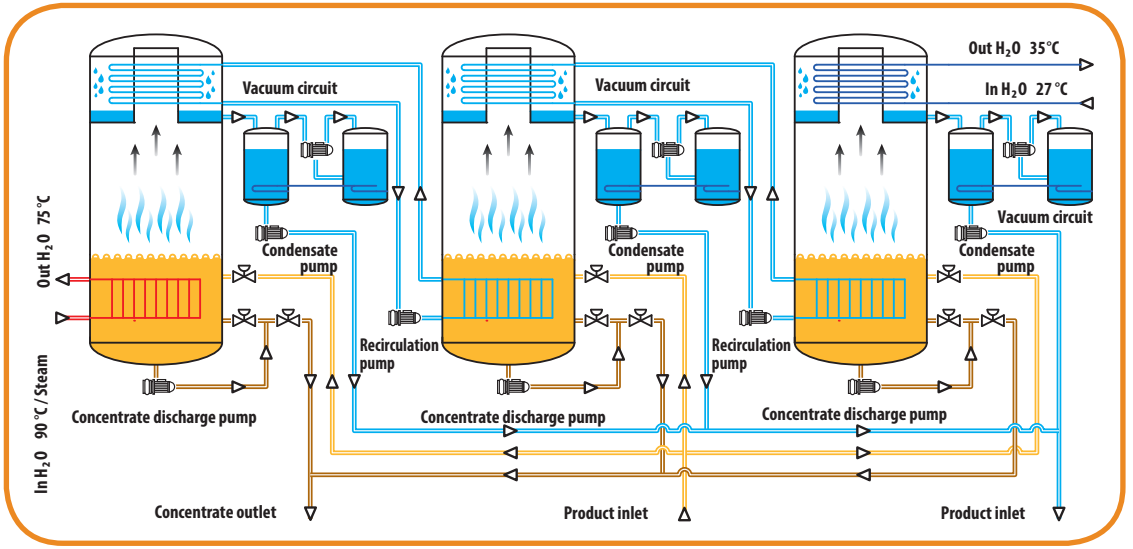
evaporators powered with hot water or steam with heat pump

DOUBLE EFFECT ETW DE SERIES WITH THERMAL SUPPLY

The ETW DE model is an evaporator of high energy efficiency.
These evaporators, as the ETW ME series, exploit the thermal power produced by hot water or steam (or diathermic oil) during the evaporation phase and the one produced by water coming from closed circuit dry-coolers or evaporation towers during the condensation phase. Moreover, the thermal energy produced by the condensate during the first stage is used to supply a second evaporation phase.
This model allows, consequently, **to reduce more than 40% of thermal energy consumption in comparison with the similar single effect model.**

TRIPLE EFFECT ETW TE SERIES WITH THERMAL SUPPLY

PF10 has developed the ETW TE model, by improving the previous system .
Besides exploiting the thermal power of the condensate produced during the first evaporation stage to supply a second evaporation phase, a third evaporation stage has been added to improve the power efficiency of the system.
This model allows **to reduce more than 60% of thermal energy consumption** in comparison with the similar single effect model.



TECHNICAL DATA - ETW DE SERIES

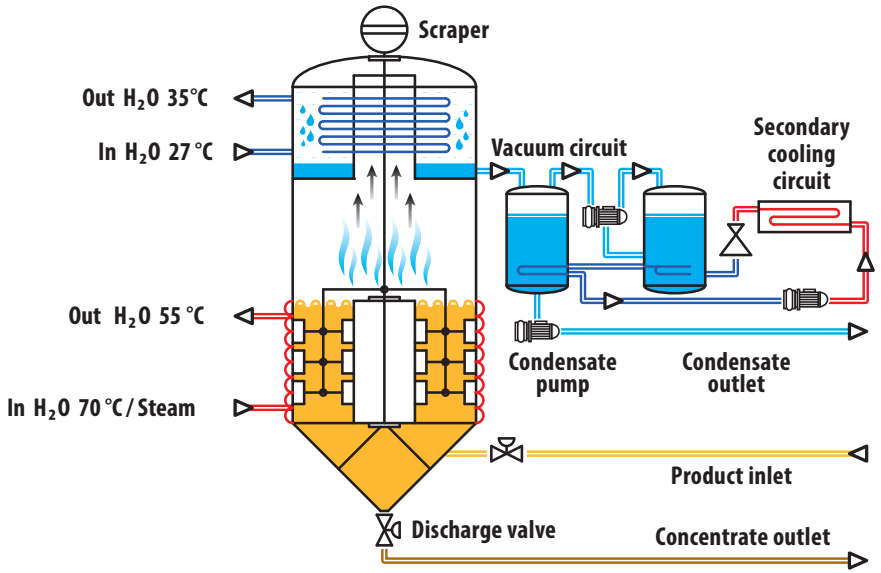
MODEL l/h	ETW 500 DE	ETW 1000 DE	ETW 2000 DE	ETW 3000 DE	ETW 4000 DE	ETW 6000 DE
Distillate l/24h	12.000	24.000	48.000	72.000	96.000	144.000
Installed power kW	18	23	36	42	50	58
Absorbed power kW	16	20	32	38	45	52
Thermal power kW (kcal)	175 (150.000)	350 (300.000)	700 (600.000)	1.050 (900.000)	1.400 (1.200.000)	2.100 (1.800.000)
Dimensions a x b x h (cm)	240x300x300	350x350x350	480x480x450	600x480x500	600x480x550	600X720X600

TECHNICAL DATA - ETW TE SERIES

MODEL l/h	ETW 750 TE	ETW 1500 TE	ETW 3000 TE	ETW 4500 TE	ETW 6000 TE	ETW 9000 TE
Distillate l/24h	18.000	36.000	72.000	108.000	144.000	216.000
Installed power kW	27	38	52	57	62	72
Absorbed power kW	24	34	48	52	55	65
Thermal power kW (kcal)	175 (150.000)	350 (300.000)	700 (600.000)	1.050 (900.000)	1400 (1.200.000)	2.100 (1.800.000)
Dimensions a x b x h (cm)	300x450x300	400x400x400	600x600x450	600x600x500	720x600x500	720X600X550

ETR W SERIES WITH SCRAPER

Among the vacuum evaporators/concentrators that exploit thermal energy powered by hot water or steam (or diathermic oil) during the first evaporation stage, the ETR W model has been developed to obtain more concentrated waste and to treat encrusting solutions.
The employment of an automatic scraper, that keeps the exchange surfaces of the vertical tank clean, allows to obtain thicker concentrates than the ones got through other evaporation systems.
The concentrate can be discharged either with a membrane pump or through a butterfly valve.



TECHNICAL DATA - ETR W SERIES

MODEL l/h	ETR W 50	ETR W 100	ETR W 200	ETR W 300
Distillate l/24h (from 40 to 0°C)	1.200	2.400	4.800	7.200
Installed power kW	6	8	10	12
Absorbed power kW	5	7	8	10
Thermal power kW (kcal)	35 (30.000)	70 (60.000)	140 (120.000)	210 (180.000)
Dimensions a x b x h (cm)	120X250X280	140X270X320	150X300X350	170X400X370

Decarbonation galvanic baths
Cristallization sulphuric pickling

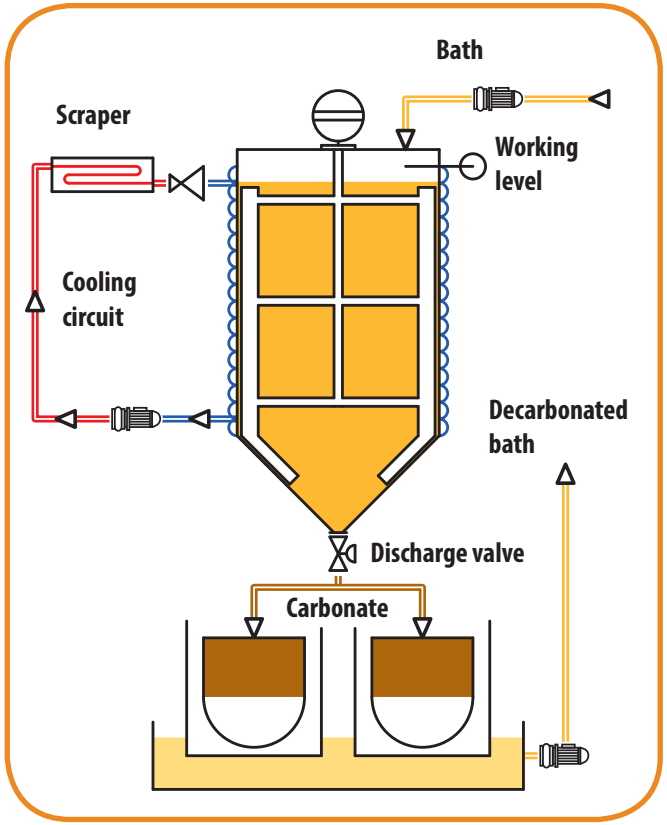
Crio Crystallizers are batch working units, that use the cooling technique to reach the solubility limit, separate the processed solutes, by obtaining solid crystals of waste.
The cooling process creates saturation on the surface of the heat exchanger and the crystals are removed through an automatic scraper.
The power used to cool the solution is supplied by a refrigeration system.

CRIO SERIES FOR DECARBONATION OF SODIUM CARBONATE ENRICHED SOLUTIONS

The decomposition of cyanide in alkaline, cyanic solutions based on sodium, copper, brass and cadmium produces carbonate, that influences negatively the process of electrodeposition. Crio crystallizers can be used for the decarbonation and removal of impurities from electrolytes.

CRIO SERIES FOR THE REMOVAL OF FERROUS SULPHATE FROM SULPHURIC PICKLING

Crio Crystallizers are used to eliminate ferrous sulphate during the process of pickling of carbon steel. As advantages, it is no more necessary to interrupt the operation to clean the tanks and less quantities of mud are produced.



TECHNICAL DATA - CRIO SERIES

MODEL l/h	CRIO 20	CRIO 30	CRIO 50	CRIO 100	CRIO 200
Distillate l/24h (from 40 to 5°C)	480	720	1.200	2.400	4.800
Installed power kW	3	4	5	6,5	10
Absorbed power kW	2	3	4	5	8
Dimensions a x b x h (cm)	60x150x200	60x180x200	70x200x200	80x220x200	80x220x220

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- OSMOSI INVERSA / REVERSE OSMOSIS PLANTS
- ASSORBIMENTO / ABSORPTION PLANTS
- ASSORBIMENTO / ADSORPTION PLANTS
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- POMPE CENTRIFUGHE / CENTRIFUGAL PUMPS
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