



Thermo Vapour Compression Distiller

TVC Series



Application

Conversion of seawater through Multi-Effect Distillation for production of high purity water for domestic and industrial use. Applicable on Cruise Liners, Oil & Gas Industry, Power Plants, Industries and domestic water production.

Features

- Simple design
- Plate type evaporator/condenser
- Titanium heat transfer surfaces
- Non-coated materials resistant to seawater and brines
- Easy access for service
- Simple and reliable automation and control
- Enhanced performance by means of thermo vapour compression

Benefits

Lowest overall water production costs:

- Simple raw water pre-treatment
- 25 years economical life
- Lowest operation and maintenance costs

Highest availability:

- > 90% of yearly hours

Simple operation & maintenance:

- Full access to evaporator heat transfer surfaces for manual cleaning
- Low educational requirement for operating crew

High distillate purity:

- Conductivity < 10 uS/cm
- Lowest cost for technical water treatment

Capacity range

Our product range covers capacities from 200 up to 25,000 m³/day per unit. Based on standard components and a modular concept, each unit is custom-designed for each particular installation.

The process

Thermo vapour compression is a distillation process, where evaporation of seawater is obtained by the application of heat delivered by motive steam and recompressed low pressure vapour.

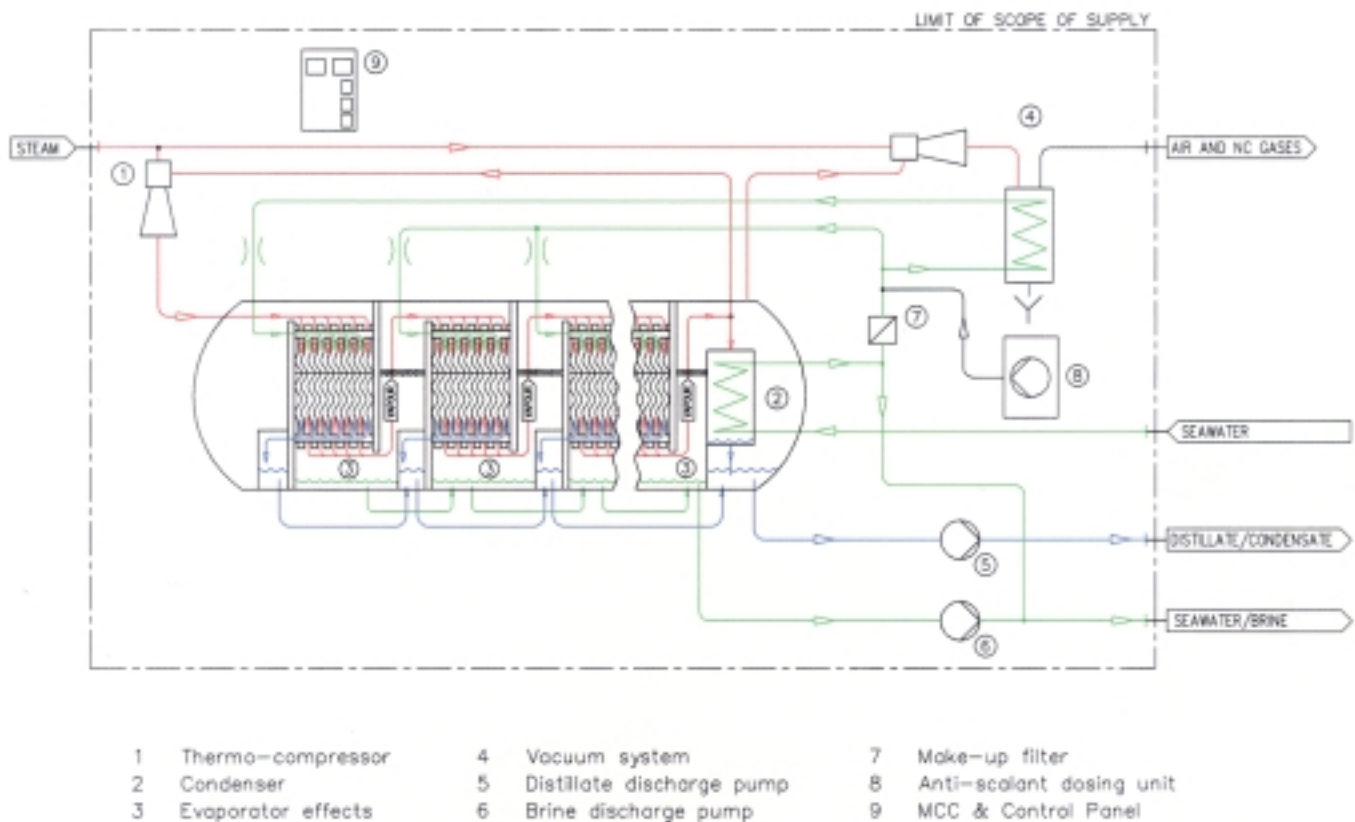
The effect of compressing water vapour is obtained by means of an ejector system (1) motivated by live steam supplied at a pressure of typically 3-10 bar. The ejector system recycles vapour produced in the last (cold) effect of the desalination process, and increases its pressure and temperature. Then the mixture of live steam and recompressed vapour is injected as heating media at the first (hot) effect of the desalination plant.

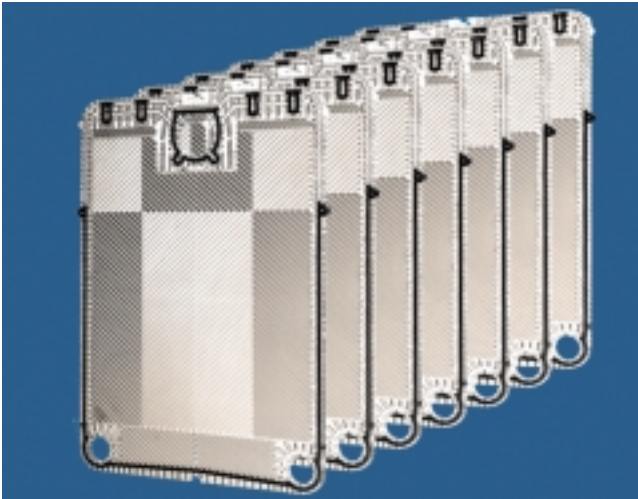
The sea cooling water is pumped into a condenser (2) and is heated by the condensation of vapour produced in the last (cold) effect of the unit. The feed-water, the water to be evaporated, is taken from the outlet of the condenser, thus utilizing the pre-heating provided by the condenser. The remaining part of the sea cooling water is rejected back to the sea.

The preheated seawater is then delivered into the Titanium plate heat exchangers' evaporator section. The seawater flows on the plates in an even and controlled falling film. While flowing down, the seawater film is heated up and partially evaporated by the heat obtained from the condensation of vapour on the other side of the plate. The released vapour then flows through a demister to the Titanium plate heat exchangers' condensing side of the subsequent effect. Here the vapour condenses into pure distillate water while transferring its latent heat, and thereby evaporating the seawater which flows on a falling film on the other side of the plates. The process is repeated in all effects of the desalination unit.

The transport of fluids inside the evaporator such as vapour, distillate water and brine is done by the pressure differential created between effects. The effect number one, which operates at the highest temperature, has the highest pressure, - the subsequent effect has a lower temperature and pressure. This pressure differential is maintained throughout all the effects of the unit.

The evaporation is done at subatmospheric conditions and vacuum is created and maintained by a venting system. The venting system can either be a water driven ejector (4), as shown on the flow diagram, or a steam driven ejector. The venting system evacuates the plant at start-up and extracts non-condensable gases during operation of the plant.





The Plate Technology

Alfa Laval's distillation equipment consists of a number of titanium plate heat exchangers, which have been specifically designed for this purpose. All plates are identical; with two gasket configurations being utilised in order to form both a condensing and an evaporating plate channel.

The plates are fitted into the evaporator vessel, forming a complete plate pack.

Compared to traditional shell and tube technology, the Plate Technology gives higher thermal efficiency. The material used for the plates is Titanium grade 1, which is considered the ultimate material concerning corrosion resistance in seawater environment (especially at elevated temperatures).

Full access to the Heating Surfaces

In the Alfa Laval plate concept, the plate pack can easily be disassembled for inspection and cleaning. In fact, the entire plate pack can easily be removed from the vessel through man-ways.

In comparison, traditional shell and tube plants have limited access for inspection. Mechanical cleaning is practically impossible. Should this be required in these systems, tubes will have to be removed and replaced, thereby incurring high costs.



Easy Removal of Scale

If calcium carbonate scaling occurs in an Alfa Laval desalination unit, it is easily removed by chemical cleaning with a mild acid solution.

However, should calcium sulphate scaling take place, most likely through mis-operation, disassembly of the plate pack can be carried out, allowing the scale to fall to the bottom of the desalination vessel.

This means that the desalination unit can be brought back on line and up to rated capacity with minimal downtime and virtually no expense.

Should this happen with traditional shell and tube units, the downtime would be extended, expensive cleaning chemicals used and virtually no guarantee that the unit will produce rated capacity. Added to this, if the scaling is significant, tubes will have to be scrapped and replaced.



The illustrations shown above are from a plant which was deliberately scaled up with calcium sulphate in order to successfully test and prove 100% cleanability.



Alfa Laval in Brief

Alfa Laval is a leading global provider of specialized products and engineered solutions.

Our equipment, systems and services are dedicated to helping customers to optimize the performance of their processes. Time and time again.

We help our customers to heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuff, starch and pharmaceuticals.

Our worldwide organization works closely with customers in almost 100 countries to help them stay ahead.



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Alfa Laval reserves the right to change specifications without prior notification.

How to contact Alfa Laval

Contact details for all countries are continually updated on our website. Please visit www.alfalaval.com to access the information direct.