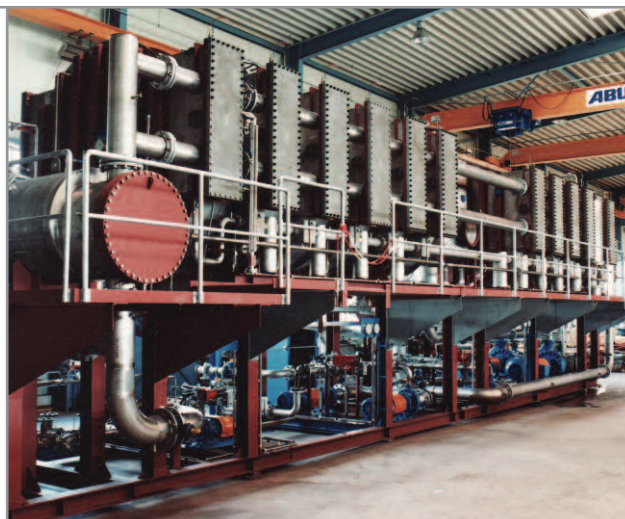




Multi Stage Flash (MSF) Evaporators

with brine recirculation for land based applications



Hamworthy Serck Como GmbH design and manufacture multi-stage flash (MSF) evaporation plants which are employed for producing fresh water from sea water, well water or industrial water. These plants are used for ships and on land based installations for producing process and potable water and are also used for reduction of the volume of industrial waste water.

Advantages:

- ▶ Sturdy construction with low maintenance demands resulting in high availability.
- ▶ Only sensible heat transfer takes place inside the tubes (i.e. no boiling occurs). This minimises the risk of scaling. Evaporation is effected by the pressure reduction from stage to stage.
- ▶ Compact construction with either a cylindrical or rectangular cross sectional design for high performance with low space requirements and weight.
- ▶ Components in contact with sea water or distillate are manufactured of corrosion-resistant materials (e.g. copper-nickel, stainless steel).
- ▶ Each evaporator is subjected to a pressure test before leaving our works.
- ▶ Qualified after-sales service and support is guaranteed.

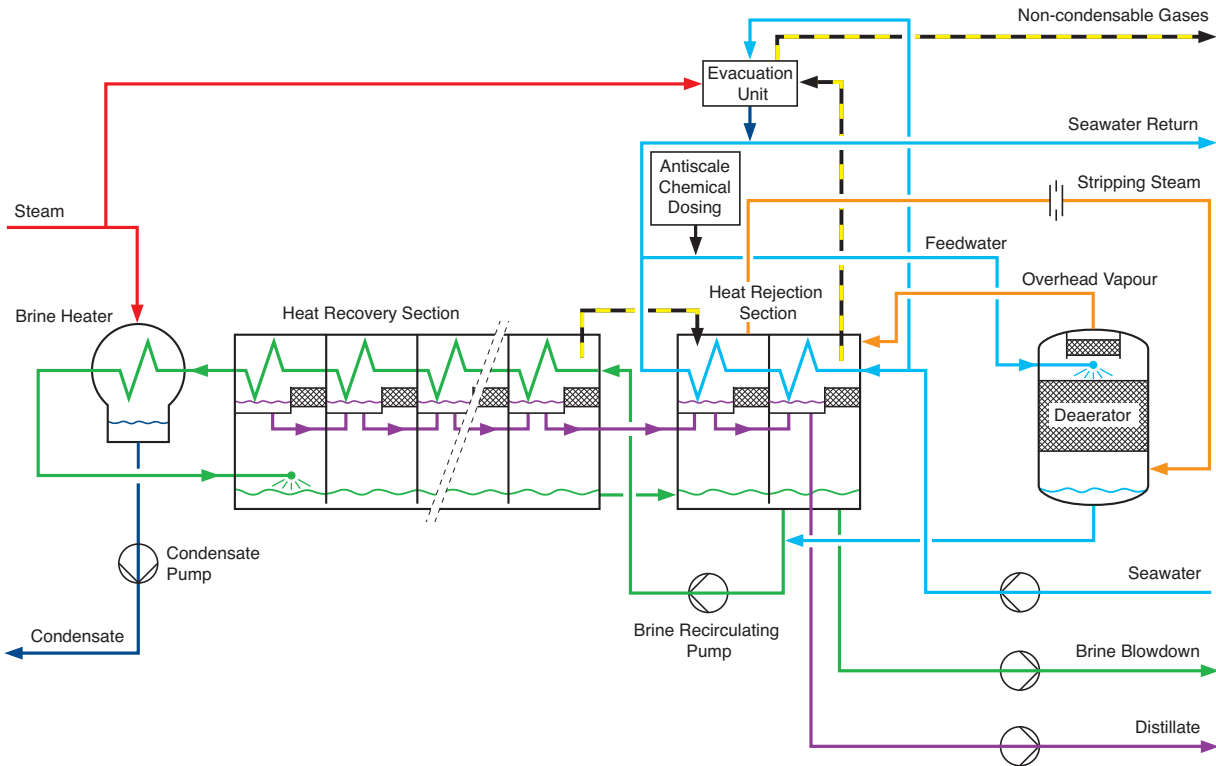
Characteristics:

- ▶ The capacity of our standard and tailor-made evaporators range from 100 t/d to 3000 t/d.
- ▶ An efficient vacuum deaerator keeps the evaporation and condensation process free from non-condensable gases.
- ▶ The residual salt content of the distillate is: $\leq 10\mu\text{S/cm}$ (4 ppm) or even less if requested.
- ▶ On request, a potable water treatment unit according to WHO - Standards can be supplied.
- ▶ Fully automatic operation (start up, shutdown and partial load).
- ▶ Computer supported design guarantees the optimum design for each evaporator in accordance with the requirements of the client.
- ▶ Our range of MSF evaporators are approved by all well known classification companies.





Flow diagram of MSF evaporators
with brine recirculation for land based applications



Description of process

Filtered sea water is pumped through the condensers of the heat rejection section. The major part - after having been used for cooling purposes flows back to the sea. The smaller part (feed water) is sprayed into the vacuum deaerator. The deaeration process is supported by stripping steam made available from the first heat rejection stage. The overhead vapour released through boiling of the feed water as well as the excessive stripping steam are fed into the last stage in order to recover the heat and to concentrate the non-condensable gases in the last stages condenser.

The reheated and deaerated feed water is treated with anti-scale chemical and added to the recirculation brine flow which is pumped to the last condenser of the heat recovery section. The brine is heated stepwise in the condensers through condensation of the vapour released in the corresponding flash evaporation chambers.

In the steam heated brine heater the brine reaches a maximum process temperature (BTT), which - according to the design - may range between 88°C and 110°C.

The brine and distillate flow from stage to stage in parallel streams whereby the pressure and temperature are reduced stepwise. The corresponding vapour quantity is produced through flash evaporation. The residual brine (blowdown) is discharged from the last evaporation chamber and the distillate from the last condenser.

As compared with once through operation, the main advantage of the brine recirculation principle is the fact that the feed water flow participating in the evaporation process is only 2.5 to 3 times the distillate production. In once through plants, this factor ranges between 8 and 12. This enables the use of a vacuum deaerator, so that the whole process of evaporation and condensation takes place in the absence of non-condensable gases, thus increasing the efficiency of the plant.



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The manufacturers reserve the right to alter the specification and data to incorporate improvements in design. Certified drawings will be issued on request.

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