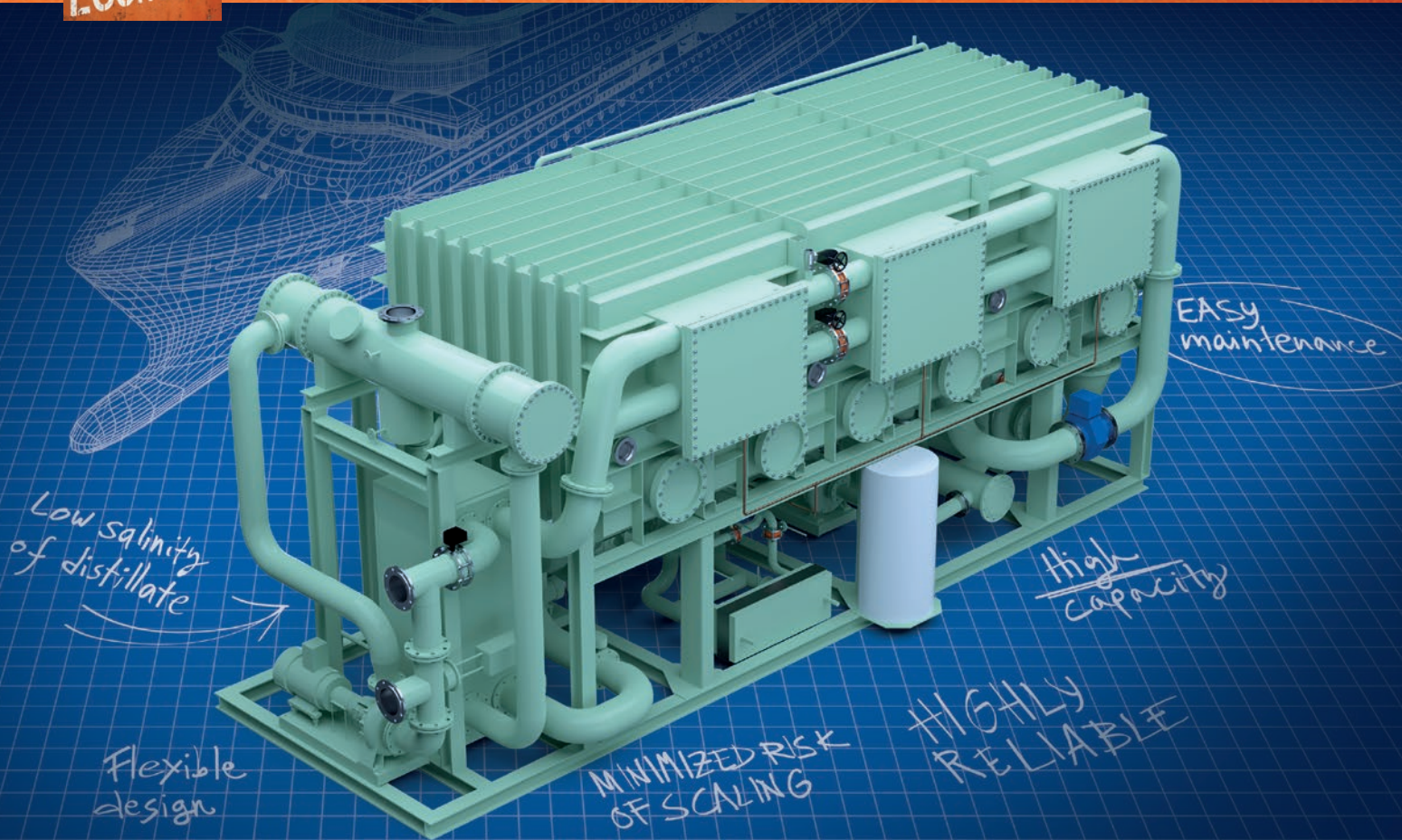


ENERGY
ENVIRONMENT
ECONOMY

WÄRTSILÄ SERCK COMO MULTI STAGE FLASH (MSF) EVAPORATOR FOR MARINE APPLICATIONS



Wärtsilä develops, manufactures and distributes thermal desalination plants for cruise ships, merchant vessels and offshore applications.

We offer an extensive range of services, from commissioning and start-up throughout the operational lifecycle, including maintenance and the supply of spare parts.

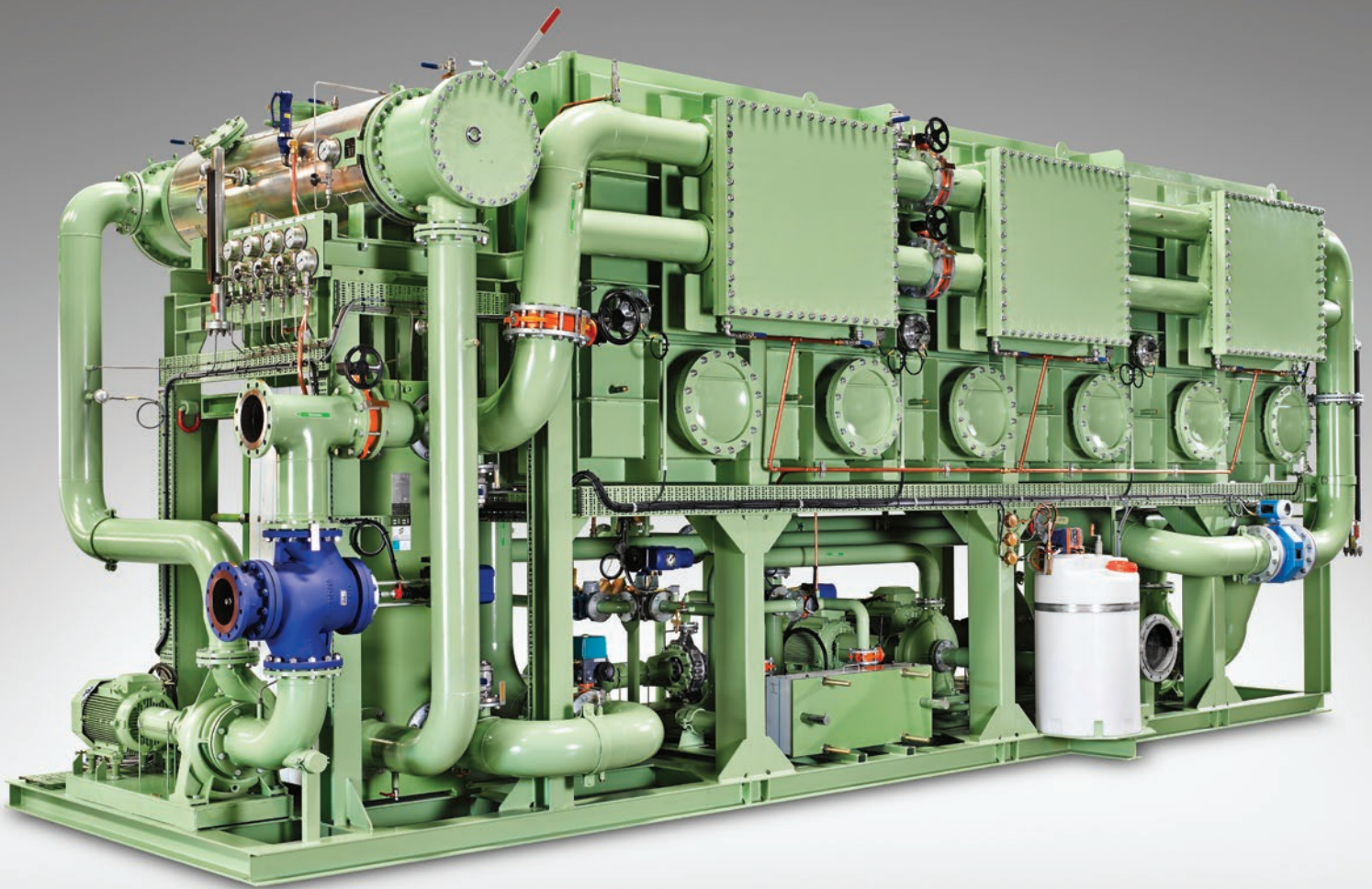
Wärtsilä's multi-stage flash principle is the most reliable thermal seawater desalination process in the world, and is the only evaporation principle where heat transfer and evaporation are strictly separated. This minimises the risk of scaling and reduces maintenance costs.

The Wärtsilä Serck Como multi-stage flash (MSF) evaporator is utilised for producing fresh water from seawater, well water or industrial water.

A special advantage of the multi-stage flash technology is that the specific heat consumption (or thermal efficiency) can be continuously adapted to the individual requirements of each application. The produced distillate has a very low salt content which makes it suitable as technical water (e.g. boiler feed water). The distillate quality and quantity are independent from the seawater temperature which makes the MSF technology a reliable source for freshwater.

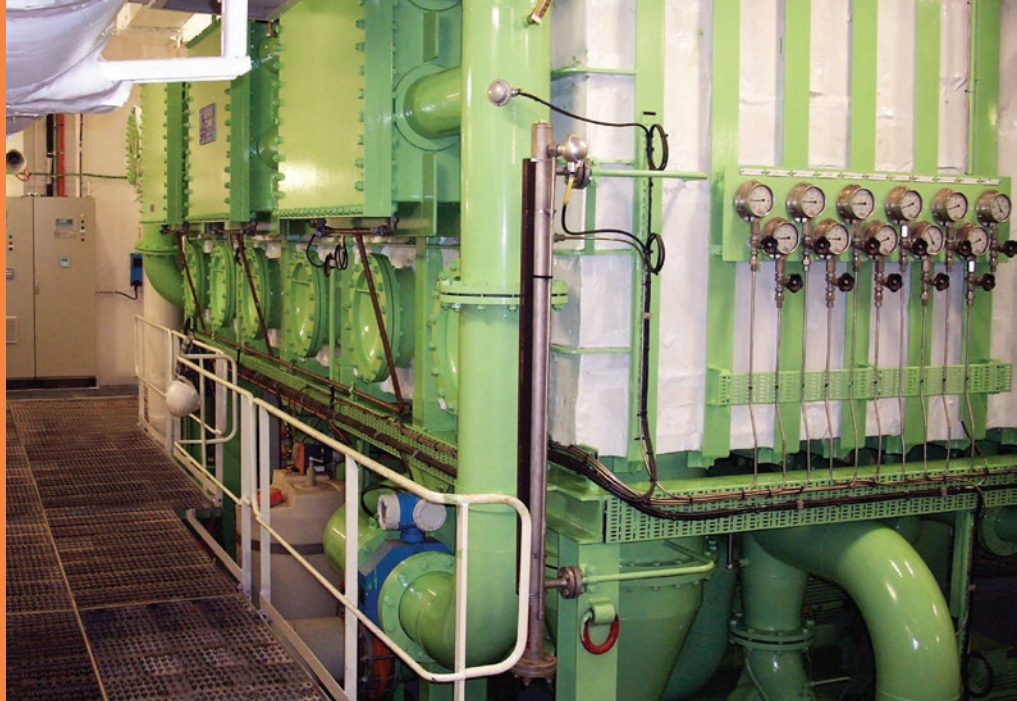
CHARACTERISTICS

- Capacity up to 1500 t/d.
- Steady production of freshwater at seawater temperatures between 0-32°C.
- Either steam, engine jacket water or a combination of these can be utilised for heating.
- Full-automatic or semi-automatic operation.



ADVANTAGES

- Heat transfer and evaporation takes place in different areas, resulting in a minimised risk of scaling (flash).
- Sturdy construction with low maintenance demands resulting in high availability.
- Lowest sensitivity to malfunction or maloperation.
- Components in contact with seawater or distillate are manufactured with corrosion resistant materials (e.g. copper-nickel).
- Technology with the lowest lifecycle costs.
- Flexible dimensions allow for the best utilisation of space.
- Operating frequency converter for pumps saves energy.
- Salt content of the distillate ≤ 4 ppm NaCl.



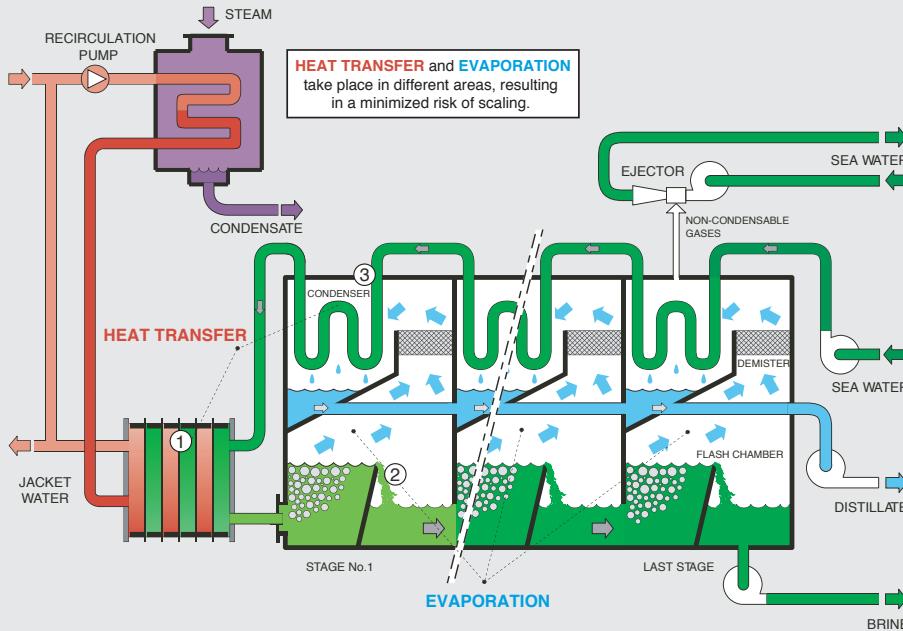
PRINCIPLE OF OPERATION

After leaving the first stage condenser (3), the seawater flows through the brine heater (1), where the heat input to the plant (steam or engine jacket water) causes a further temperature increase. The seawater leaves the brine heater (1) and enters the first flash chamber (2), reaching a brine top temperature of approx. 80°C. At this point the pressure of the incoming seawater is suddenly reduced, by means of an

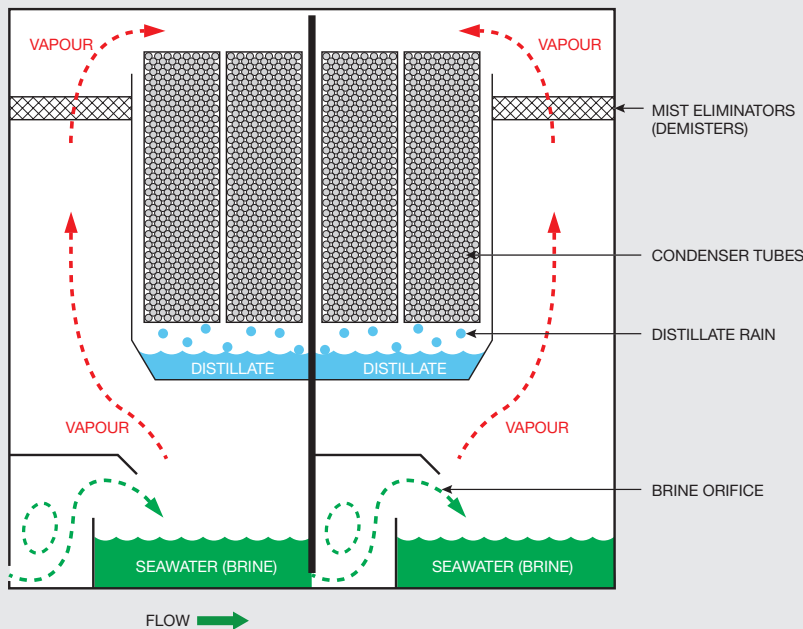
orifice, below its equilibrium vapour pressure resulting in explosive boiling or evaporation (flashing). The pure vapour produced is then condensed giving up its latent heat to preheat the incoming seawater (3). If this process is repeated over a large number of effects, at successively lower pressures and temperatures, large distillate production rates at reasonable performance ratios can be achieved.

Flow diagram of a MSF evaporator

Steam and/or jacket water heated with jacket water booster



Evaporation and condensation



MATERIALS

- Condenser tube material: CuNi, CuZn
- Pipes in contact with seawater: CuNi
- Pipes in contact with steam, motor-water, condensate: Steel
- Distillate: CuNi
- Shell: CuNi

TECHNICAL DATA

- Maximum capacity: 1500 t/d
- Maximum length: 12000mm
- Maximum width: 3900mm
- Maximum height: 4000mm

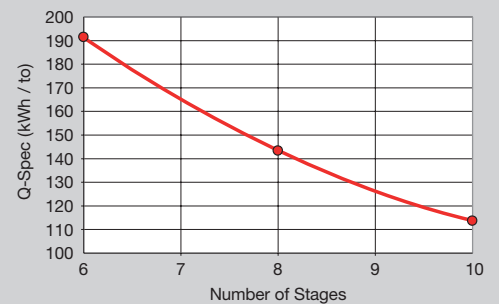
THIRD PARTY INSPECTION

- DNV GL
- Rina
- LR
- BV
- ABS
- RMRS

SCOPE OF SUPPLY

- Flash vessel with condenser and condenser tubes
- Base frame
- Pumps, incl. electric motors
- Air ejectors
- Feed water heater
- Distillate cooler
- Complete internal pipework
- Control equipment and instrumentation
- Optional steam booster

SPECIFIC HEAT CONSUMPTION



EXPERIENCE AND RECENT SUCCESSES



QUEEN VICTORIA

Scope of supply: 2 x Wärtsilä Serck Como MSF evaporators each with a capacity of 650m³/day and 6 stages.

Shipowner Carnival Corporation
Shipyard Fincantieri, Italy



CORAL PRINCESS

Scope of supply: 3 x Wärtsilä Serck Como MSF evaporators each with a capacity of 600m³/day and 6 stages.

Shipowner P&O Cruises
Shipyard STX Europe, Finland



OASIS OF THE SEAS

Scope of supply: 4 x Wärtsilä Serck Como MSF evaporators each with a capacity of 825m³/day and 8 stages.

Shipowner ... Royal Caribbean International
Shipyard STX Europe, Finland

SERVICES

Wärtsilä supports its customers throughout the lifecycle of their installations by optimizing efficiency and performance. We offer expertise, proximity and responsiveness for all our customers in the most environmentally sound way.

Wärtsilä Serck Como has an in-house service team that is able to assist you with the installation and commissioning of the unit, as well as being available for repairs and maintenance. We use state-of-the-art technology to analyse the condition of the plant, such as:

- Eddy current test EN 473 / SNT-Tc-1A
- Thermal imaging camera
- Ultrasonic leak-detection



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