

## THE BASIC PRINCIPAL OF THE AFGU SINGLE STAGE

The basic principle is the vacuum evaporation in vertical tubes utilizing water from any Waste Heat Recovery, so as Diesel Engines, Steam Turbines or Steam Boilers for production of fresh water with a low salinity ( less 2 ppm).

Although the Principe is very simple and only **ATLAS** has been able to obtain an optimal dimensioning of the many parameters in the process

The heating media, being engine cooling water, boiler / turbine water, or the like (possible steam) is led to the heat exchanger, which is the lower part of the generator.

At the cross current of the heating medium around the vertical nest of pipes, the heat is transferred to the sea feed water, which is supplied at the bottom of the heat exchanger.

The heat exchanger tubes are fed with sea water which then is heated under a vacuum to an evaporating temperature of 45<sup>o</sup> to 80<sup>o</sup> C .



The sea water, during the evaporation process, is drawn to and up the inside of the heat exchanger tubes creating a raising film.

The raising film, caused by the vapour force, forms a large evaporation surface and protects the tubes against boiling dry which would cause scale formation.

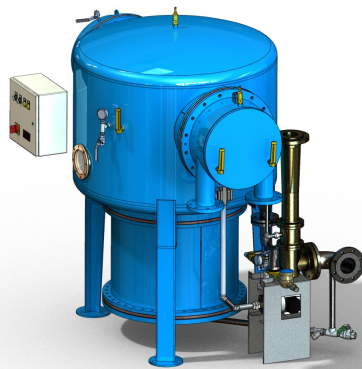
In order to eliminate the risk of scale formations completely, **ATLAS** offers a complete and simple chemical dosing

unit, which easily can be connected to the feed-water connecting branch at the bottom of the heat exchanger. The consumption and costs of this harmless chemicals are insignificant. Pre-treatment of the feed water or disinfection is not necessary.

The evaporating process, which can be observed through an inspection glass in the upper part of the generator, the separator, will be protected by a circular baffle plate (Deflector) with an bilge placed immediately over the heat exchanger. Droplets from the evaporating process will with this arrangement be separated off and through a number of pipes installed on the bilge led to an outlet at the bottom of the separator together with the non-evaporated and concentrated saline water, the brine.

The salinity of the vapour is further reduced in the separator chamber, due to a considerable reduction of the speed of the saturated vapour resulting in the small liquid particles, which have been carried along, being separated by gravity.

In the upper part of the separator, the transverse condenser pipe nest is placed. The saturated vapour condenses around the horizontal pipes in which the sea cooling water circulates and the condensate is collected in a shell which covers the lower part of the pipe nest.



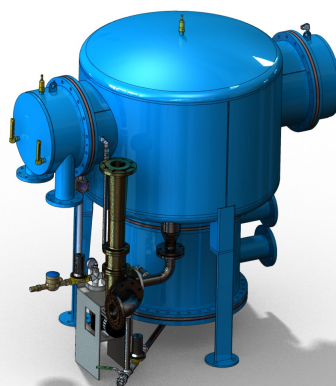
From this reservoir the distillate is drawn out of the separator by a freshwater pump which sends along distillate through the salinity sensor and the water meter. In case of too high salinity the sensor will by-pass the distillates up into the separator again by activating a solenoid valve. The salinity can be read on the salinometer.

The ejector pump supplies the generator with sea feed water as well as ejector service water and in the E-coupling of the plant, furthermore with sea cooling water to the condenser ( see section “The General Plant Description”).

The suction side of the ejector pump can in the S-coupling of the plant be connected to the outlet of the condenser in a T-piece by which a preheating of the sea feed water is obtained.

The function of the ejector is to discharge brine and air gases released from the sea water during evaporation.

Finally to meet the requirement from the customers, **ATLAS** are today able to supply the AFGU fulfilling the ATEX EEx II 3G EExd regulation, for the installation in explosive areas.



## PLANT DESCRIPTION

The single effect Freshwater Generator program includes two coupling forms, called E respectively S.

### TYPE AFGU 1 – E

The Freshwater Generator, type AFGU 1 E, is supplied with a separate ejector pump supplying sea feed water as well as sea water to both the ejector and the condenser, from a separate sea-water intake. – This installation will not interfere with the main seawater cooling system of the ship.

### TYPE AFGU 1 – S

The Freshwater Generator, type AFGU 1 S, is supplied with a built-on or separately delivered ejector pump supplying the sea feed water and sea water to the ejector from the sea-water flow, which has passed the condenser. The condenser is supplied with sea water from the main cooling system of the ship or direct from the sea.

The capacities range from 10 to 100 m<sup>3</sup>/24 h is covered by seven different sizes of the single-effect Freshwater Generator type AFGU 1, ensure the most reliable and economic solution to any demand for supply of high-quality freshwater on board type of vessel. Up to 15 m<sup>3</sup>/24h freshwater per 1.000 BHP Diesel engine output (equal to 20 m<sup>3</sup> per 1.00 kW) can be produced by the single-effect type AFGU 1 S/E, when utilizing the jacket cooling water of the engine or steam from a boiler as heating media.

