



Clean water for your boiler



*Spray-type Deaerators*  
*Stork Thermeq*

# Spray-type Deaerators

## General

Many decades of experience have given the Stork spraytype deaerator a unique place in the deaerating industry. The patented design has been used world-wide in power plants and industrial installations to the full satisfaction of our customers. Continuous improvements and flexibility make it possible to provide highly competitive solutions for power plant design.

## Operating principle

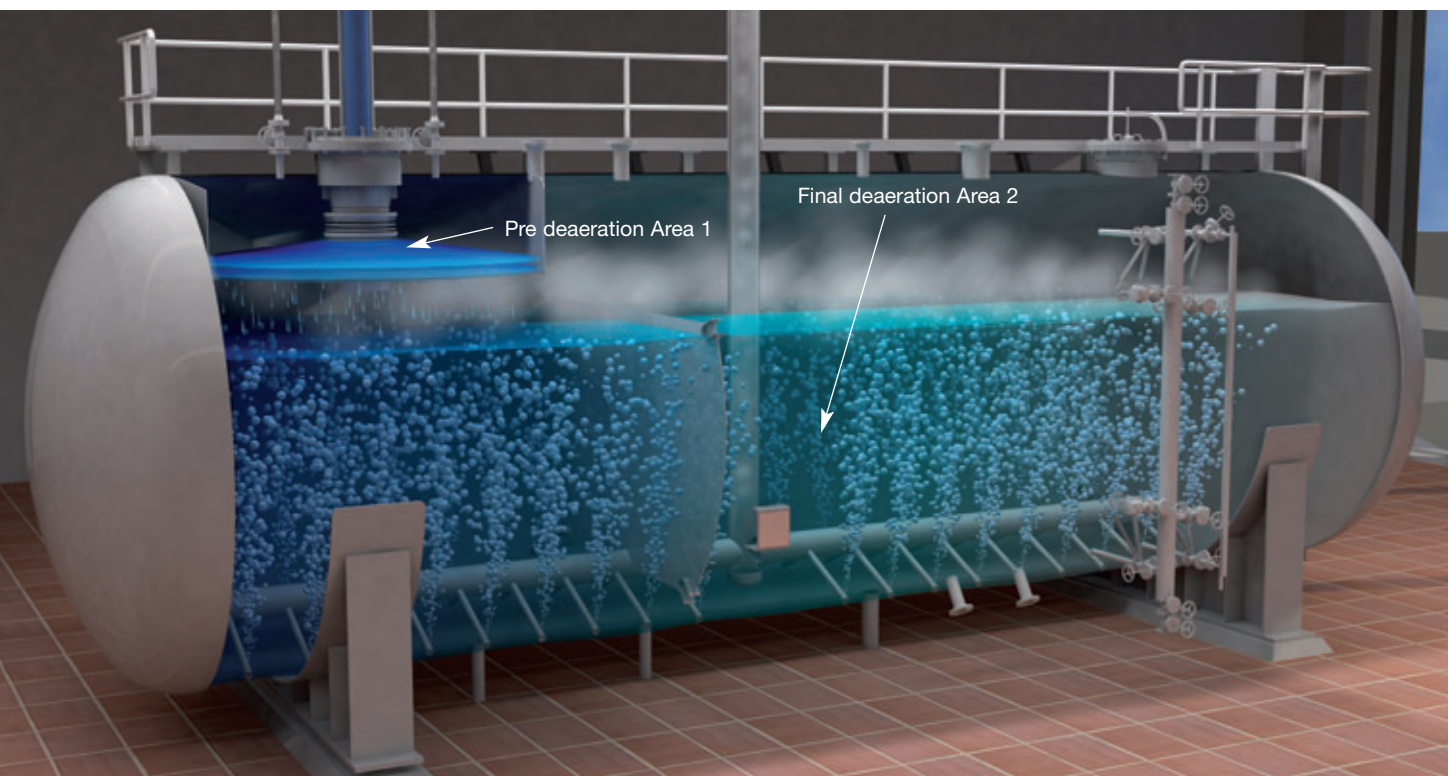
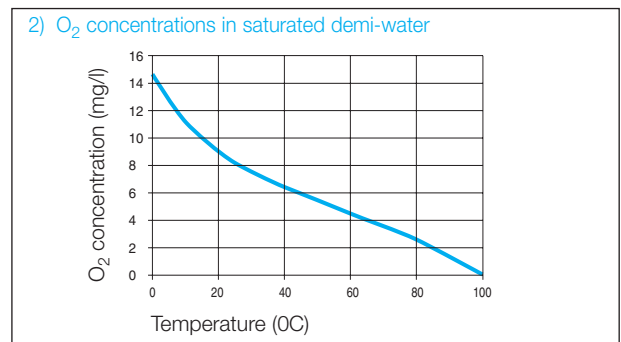
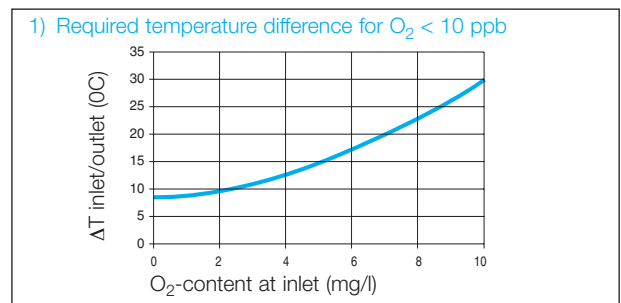
The operation of the deaerator is based on physical deaeration which takes place in two steps:

Pre-deaeration in which water is sprayed in a part of the steam space (area 1);

Final-deaeration in the water tank where steam is brought in close contact with the water to be deaerated (area 2).

The pre-deaeration (area 1) is achieved by the Stork spraying device. Under all kind of operating conditions, the sprayer assures heating up of the condensate to saturation temperature and a very large area for mass

transfer. As the solubility of oxygen in water at saturation conditions is practically zero, oxygen transfers from the water droplets to the surrounding steam. As the steam condensates on the water, the concentration of oxygen in the direct vicinity of the sprayer is increased making it possible to vent a small amount of steam with a relatively high oxygen concentration.



Final deaeration (area 2) in the water tank is achieved by injection of steam in the water tank. Depending on the conditions steam, pressurized hot water, steam/water mixture can be used for deaeration.

A proper designed steam device, taking into account the hydro-dynamics in the water tank, will result in good contact between water and steam, allowing the oxygen to move from the water to the steam in accordance with Henry's law.

## Stork deaerator types

The Stork spray-type deaerator can be operated at pressures from 0.2 bar up to 15 bar for typical installations. The minimum required temperature difference\* for good deaeration is a function of the operating pressure and the amount of oxygen entering the deaerator (see also the graph on the previous page). There is no limit on the maximum temperature difference and the associated steam volume flow.

\* Temperature difference between the incoming water and the feed water outlet temperature.

**At Stork Thermeq we have spray-type deaerators for different applications. They are:**

### Horizontal

With more of 100 years of experience and more than 2000 references, this kind of deaerator is applicable in power generation, process and chemical industry. Its standard capacity is from 10 to 2500 t/h and it operates up to fully demineralised water: outlet below 7ppb. Also in this line, we have the Vacuum and the Nuclear deaerator.

**Vacuum:** Used in power generation, process and chemical industry. It has a compact construction and its operating pressure goes down to 0.2 bar. Vacuum and overpressure operation is possible, depending on the fuel to be fired.

**Nuclear:** Its application is in nuclear power plants. It has high capacity up to 6000 T/H of even higher.

### Vertical

This kind of deaerator is suitable for areas where small footprint is required. The net volume is up to 30 m<sup>3</sup> and its capacity goes from 10 to 450 T/H.

### Internal Drum

It is installed inside the low pressure drum of HRSG's. There is not external steam source required and it has a capacity from 50 to 450 T/H. The content of oxygen in the condensate from condenser should be:  
O<sub>2</sub> inlet < 100 ppb.

### Condenser deaeration

It is applicable when demi-water deaeration inside condensers (air cooled) is necessary. Operating pressure is from 0.1 - 0.2 bar. It

operates with or without external steam source.



### Marine/FPSO

#### (Floating Production Storage and Off –Loading)

It is used for steam generation on board of floating vessels. It is compact and low-height design. It has an excellent deaerating performance under "marine conditions". It has a capacity until 500 T/H

### Retrofit

In case you want an increased capacity with the same storage vessel of the tray type deaerator, a retrofit with Stork technology is an advantage because it improves deaerator performance and reduce maintenance and operations costs.

### Licence

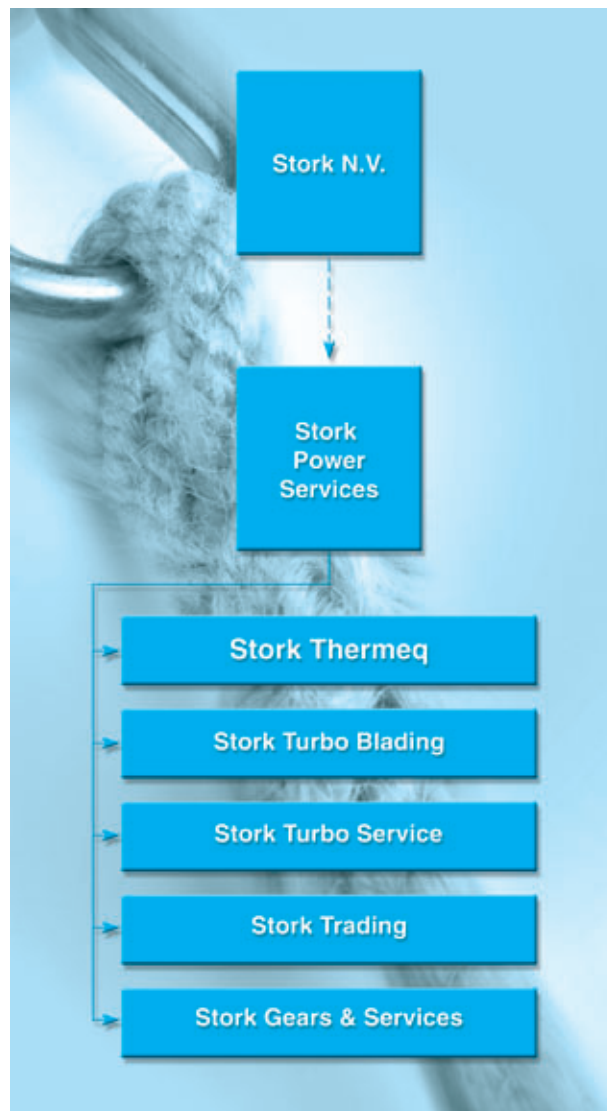
All the above mentioned types can be also delivered under Stork licenses with partners all over the world.

## Features

- Reduction of oxygen concentrations to levels below 5 ppb over wide operating ranges (10 to 110%);
- High reliability/availability;
- Single shell design;
- Deaerated water available as soon as the deaerator is pressurised;
- Possible deaerating media: (superheated) steam, steam/water mixtures, hot-water or combinations here of;
- Sliding pressure operation possible, from vacuum (0.2 bara) to several bar over pressure;
- Robust design, allowing very rapid load changes;
- Low vent losses, 10 to 70 kg/h depending on amount of incoming oxygen;
- Capacity range at the outlet from 10 to 6000 ton/hour, special models possible.



## The Stork Network



## Advantages

Lower Total Cost of Ownership, due to:

- Simple, robust design resulting in minimal maintenance;
- Steam consumption savings by a very small vent flow, no vent condenser necessary

Single shell design, resulting in:

- Compact construction with low overall height;
- Lower insulation and piping costs compared to other designs;
- Simple erection;
- High earthquake resistance;

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