

CLASS "S" – SPRAY TYPE

DATED 6/6/19
SUPERSEDES 1/15/03

MECHANICS OF DEAERATION

Extensive research proves that to inhibit corrosion in a steam system, the oxygen content must be limited to a maximum level of .01ppm (.0075 cc/1). A true deaerator will reduce the oxygen to the .005 cc/1 level and the carbon dioxide to zero. A further benefit of this process is the simultaneous pre-heating of the feed water. More rapid removal of gas occurs when the liquid is sprayed in a thin film and then violently scrubbed by the incoming steam.

The modern spray-type deaerator has evolved into a two stage device, the pre-heater and the scrubber where water and steam are mixed at controlled velocities. It is essential that the first stage (pre-heater) heat the feed water to a temperature approaching that of the operating steam pressure.

The effluent then enters the second stage (scrubber) where it is vigorously boiled and scrubbed with fresh steam. This forces the remaining traces of oxygen and carbon dioxide to the surface of the liquid, where they are liberated from the water.

Non-condensable gases must be evacuated from the deaerator at a rate equal to their liberation. A vent condenser is utilized to concentrate these gases and condense the carrier steam, thereby avoiding unnecessary steam venting.

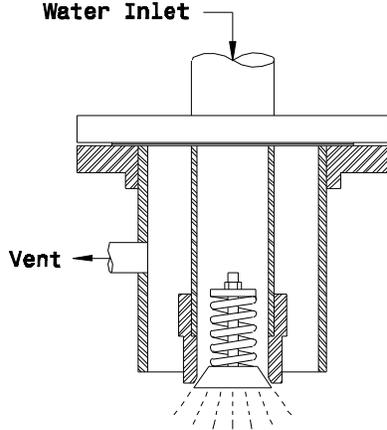
OPERATION

Incoming water first enters the deaerator through the spray valves, directed downward into the steam atmosphere in the first stage pre-heater section. There the water is heated to within two degrees of the steam temperature in the deaerator. This is accomplished by spraying water through self-adjusting spray valves designed to produce a uniform, thin, continuous film thru all load conditions. These efficient valves assure a constant temperature and uniform gas removal.

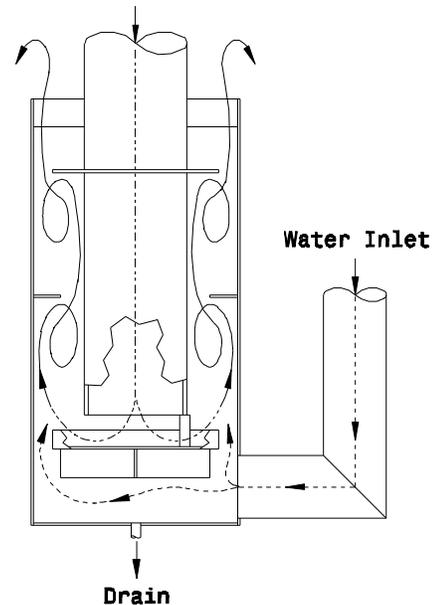
From the first stage the pre-heated water, containing traces of dissolved gases flows into the second stage, scrubber section. Here the water is brought into direct contact with an abundance of fresh, gas-free steam. The steam enters this stage at the base of the scrubber and is vigorously mixed with the pre-heated water. This direct physical contact shakes loose the dissolved gases, separating them from the effluent. Very little steam is condensed here, as incoming pre-heated water has a temperature approaching that of the steam. The water leaving this stage, now completely deaerated and heated to the steam temperature corresponding to the pressure within the vessel, spills into the storage section where it remains ready for use.

A reduction in temperature and pressure in the vent condenser is created as the entering water condenses the steam atmosphere. This causes a steam flow toward the vent condenser, carrying with it the liberated gases. Here most of the steam is condensed, and the remainder carries the residual gases through the vent to atmosphere.

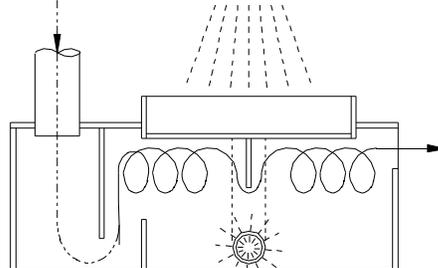
SPRAY VALVE AND INTERNAL VENT CONDENSER ASSEMBLY
Capacities over 30,000 lbs./hr. will have multiple spray valves
Water Inlet
Vent



VERTICAL SCRUBBER
Capacities 14,000 lbs./hr.-up
Steam Inlet
Water Inlet
Drain



HORIZONTAL SCRUBBER
Capacities up to 11,000 lbs./hr.
Steam Inlet
Water Inlet



bfs INDUSTRIES, LLC
BUTNER, NORTH CAROLINA