Deaerator & Feed Water Storage

Product Description

A deaerator is a mechanical tool used to remove dissolved gases from water, typically oxygen and carbon dioxide. By adhering to the surfaces of metal pipework and other equipment and creating oxides, dissolved oxygen in feedwater will severely degrade a boiler's ability to resist corrosion.

Water and dissolved carbon dioxide combine to generate carbonic acid, which might lead to additional corrosion. Most of the deaerators are designed to remove oxygen levels down to 7 ppb or less by weight and also essentially eliminating carbon dioxide.
A liquid's solubility in a gas is zero when it reaches its saturation temperature, according to the principle underlying the deaeration process.

However, in order to assure complete deaeration, the liquid must be agitated or boiled. Knowing how much steam is required to heat the deaerator is crucial for proper system design and steam supply valve sizing. Mass/heat balance is used to determine the necessary steam flow rate. It operates under the premise that, in a particular system, the heat obtained by the cold fluid is equivalent to the heat lost by the hot fluid. In other words, the heat provided by injected steam plus the quantity of head in the input water must match the heat added by the feed water plus the mass of condensed steam at the end of the operation.

A vertical domed deaeration portion is positioned above a horizontal boiler feedwater storage tank in a spray and tray-type deaerator. Spray valves above the perforated trays allow boiler feedwater to reach the vertical deaeration section, where it subsequently passes through the perforations as it descends. Under the perforated trays, low-pressure deaeration steam enters and rises via the holes.Due to the prolonged contact time between steam and water, the combined action of spray valves and trays ensures exceptionally high performance.

To prevent excessive wear and tear, the steam velocity in a steam distribution system should stay within defined bounds. For effective and secure operation, the recommended velocity should range from 10 to 30 m/s. Design considerations for the Steam Input Diffuser: A good diffuser system should produce turbulence and distribute steam evenly at the diffuser's outlet for efficient heating and deaeration of the inlet water. For uniform dispersion, the diffuser outlet is positioned close to the tank's bottom and distributed over the length of the tank.

The pipe's internal velocity is 15.5 m/s, and a maximum operating velocity of 25 m/s will be maintained. The water in the Tank must be heated using the diffuser system. The initial deaeration process in the column region has already preheated/deaerated the stored water.

However, taking into account the inlet water temperature, we will obtain the necessary steam flow rate through the diffuser equal to the value established in the heat balance calculation in order to estimate the maximum flow rate of steam in the diffuser zone. Controlling the flow of water entering the tank is done using a level control valve.

The tank must always have a minimum storage capacity. It is advised to provide a minimum of 10 to 20 minutes of storage time for deaerators. As a result, it is necessary to maintain the certain levels. The amount of liquid in the tank will increase as steam condenses, and any extra liquid is drained through the liquid condensate outlet.

Control of steam: The steam supply is controlled by a modulating control valve. To maintain pressure inside the vessel, this valve is controlled by a pressure controller. Since it serves as the foundation for the deaerator's temperature regulation, precise pressure management is crucial.

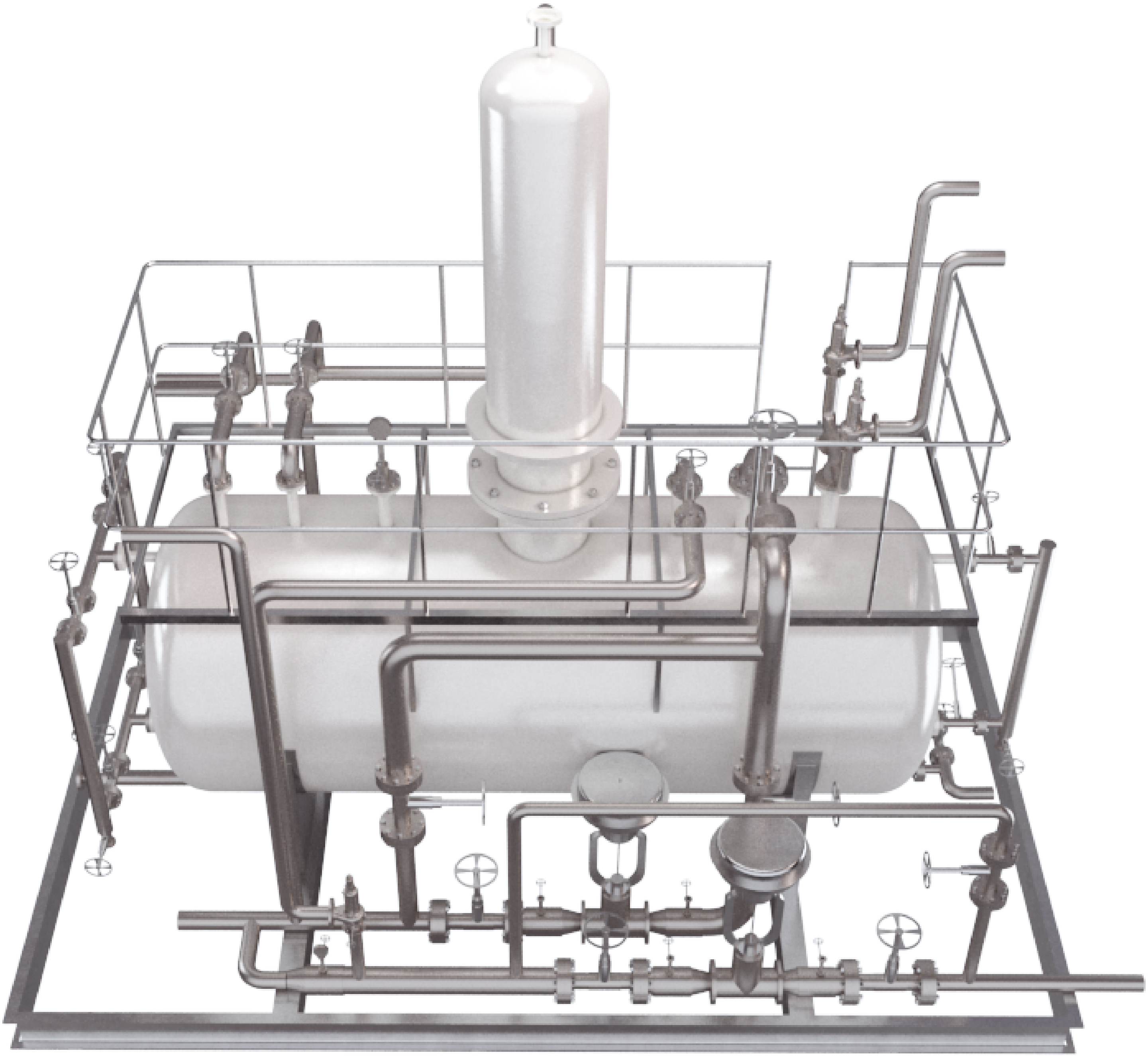
At the tank's head, steam is introduced, and in the column portion, it flows in opposite direction to the water. Additionally, the steam is dispersed into the tank's water pool for additional heating and deaeration, guaranteeing even steam distribution and full elimination of the dissolved gases.

Considerations for Tray Design

This is initially accomplished in the column part of the Spray-Tray type Pressurized Deaerator by passing the water via tray perforations, which increases the surface area to mass ratio and enables fast heat transfer from the steam to the water, which soon reaches steam saturation temperature. The dissolved gases are released during this process, and they are subsequently transported to the vent together with the extra steam.

Second, a steam diffuser will heat and dehydrate the water that is dropping into the tank. To achieve total removal of dissolved gases from the inlet water, a two-stage deaeration process is used. To increase the surface area to mass ratio and split the incoming water into little droplets, the Trays are offered. This is crucial for increasing the water's temperature and releasing the gases during the residence's extremely short time in the water. A tray design is offered for effective steam and water mixing and contact with each other.

The requirement is that the velocity of water should be less than 1-2 m/s and that of steam should be less than 25–40 m/s. Other non-condensable gases will also need to be rejected at the same time as the oxygen. As a result, the deaerator will release some steam as well as other air components, mostly nitrogen. The rejection rate of air from the water must consequently be considerably higher than 3.5 grams of oxygen per 1000 kg of water.



It's crucial to keep in mind that the deaerator's main goal is to eliminate gases. Therefore, it is crucial that these gases, after they have been sorted out, are eliminated as soon as possible and before there is a potential of re-entrainment. The mixture is blown out after the dissolved gases are evaporated using steam.

The only method to remove this air from the deaerator when it combines with the steam in the area above the water's surface is by simultaneously releasing steam. Dalton's Law of Partial Pressures and Henry's Law can be used to determine the amount of steam/air combination that has to be discharged.

Although the theory predicts that each tonne of deaerator capacity should need 22.4 grams of steam/air combination, in actuality it is hard to adequately monitor or manage. Therefore, a venting rate of between 0.5 and 3 kilogram of steam/air mixture per 1000 kg/h of deaerator capacity is advised to be on the safe side based on actual experience

Product Recommendations

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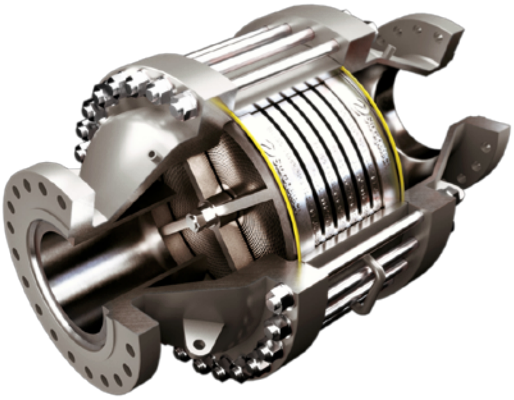


Flame Arrester

Vertical, in-line, detonation

Storagetech™'s Model 320 In-line Detonation Flame Arrestor (also called flame arrestor or fire arrestor) is designed for installation in gas pipelines. Detonation occurs when a flame travelling through the pipeline reaches supersonic velocities, usually as a result of the pipeline configuration or pipeline surface roughness. Changes in gas density and pressure causes the flame velocity to metamorphose from subsonic to supersonic.

The flame quenching element is designed to be three or four times the area of the pipe in which it is installed, and is assembled between two flanged reducing spools. The element comprises a tightly rolled scroll or scrolls of crimped stainless steel ribbon to form passages through which the vapour passes. The area of each passage determines level of protection that the element provides. ERGIL Storagetech™'s Model 320 In-line Detonation Flame Arrestor has a maximum experimental safe gap (MESG) as per the standard, and is suitable for gas groups IIB and IIA.

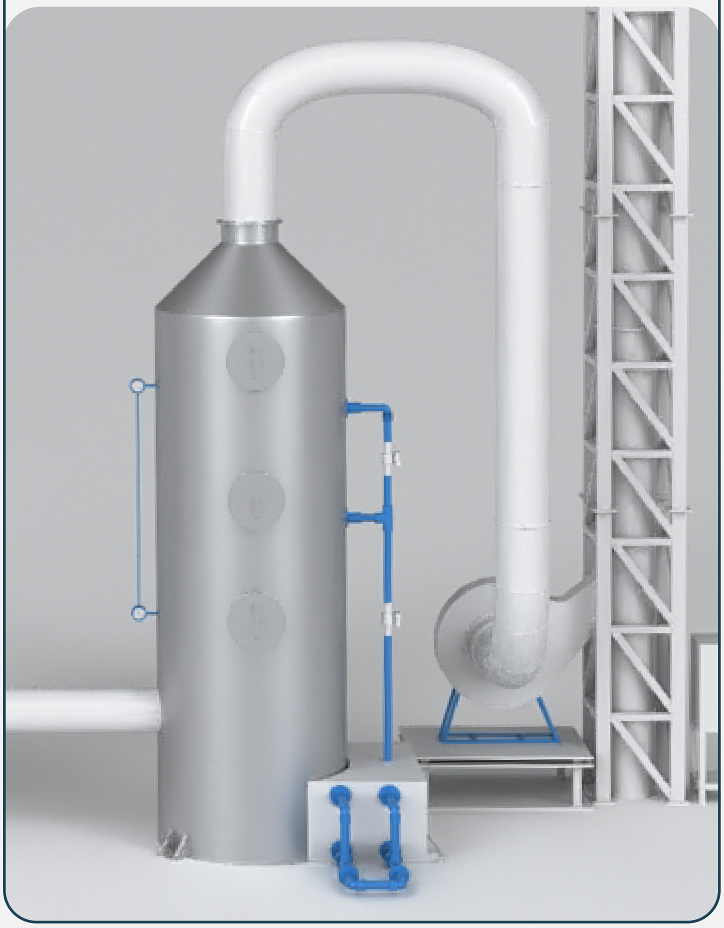
The detonation flame arrestor is more robust than the deflagration flame arrestor, and contiguous scrolls have smaller MESGs to withstand higher pressures and to quench detonations. It should be installed in the pipeline where there is a significant distance between the unit and the potential source of ignition.

Scrubber Systems

Chemical Gas Washing Systems

The harmful gases and odors caused by the activities of industrial facilities and enterprises pose a great threat to human and environmental health.

It is necessary to develop some systems to protect our environment from these harmful substances. Gas purification systems installed in this direction contribute significantly to ensuring environmental safety. This system prevents the formation of acid rain by purifying the acidic gases from the exhaust before being released into the sky.



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