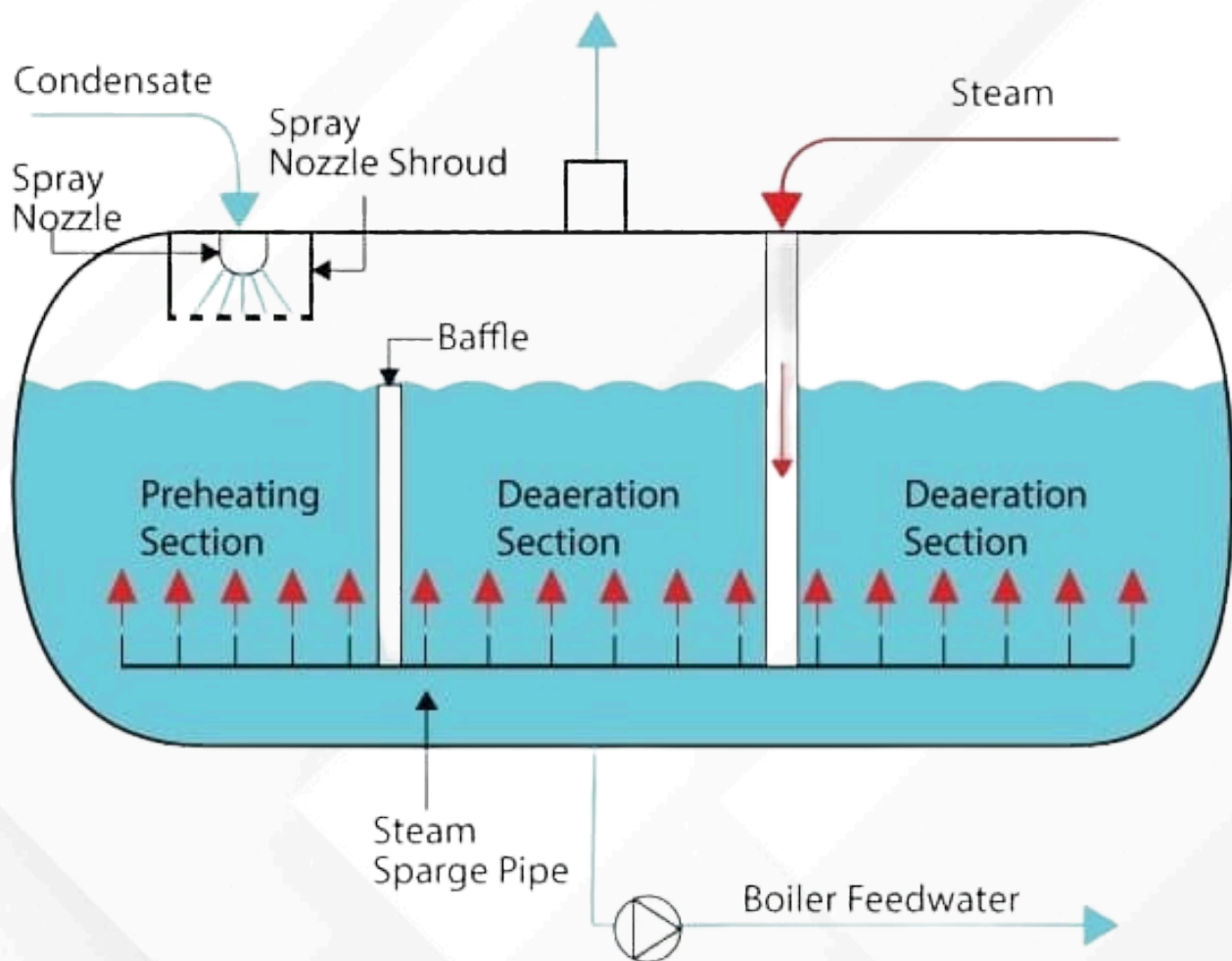


DEAERATOR

Boost Efficiency and Longevity: Precision Deaeration for Reliable Boiler Operations



Imagine opening a hot and cold carbonated drink: the hot one releases a loud hiss as gases rapidly escape, while the cold one retains its fizz. This illustrates the principle of deaeration.

A Pressurized deaerator uses this concept to remove dissolved gases like oxygen and carbon dioxide from boiler feedwater. As an essential component of a steam system, the deaerator not only protects your equipment but also maximizes energy savings by ensuring close loop steam network. With a deaerator, you achieve reliable operations, improved efficiency, and lower energy costs.

KEY FUNCTIONS

STEAM SAVER: "TURNING UP THE HEAT WITHOUT TURNING UP THE BILL"

Recycles energy from closed-loop steam systems, reducing live steam requirements and improving overall system efficiency. By minimizing the amount of gas to be removed, it lowers steam consumption and energy costs.

BOILER'S BEST FRIEND: "NO MORE COLD WATER SURPRISES"

Preheating feedwater to ~105°C ensures a smooth transition of water into the steam, preventing thermal shock to boilers & Components.

O₂ EVICTION EXPERT: "BYE-BYE, OXYGEN"

Lowers dissolved oxygen to 7 ppb, preventing corrosion and reducing chemical treatment costs.

RUST BUSTER: "KEEPING YOUR BOILER SHINY INSIDE"

Removes carbon dioxide and other harmful gases that lead to pitting and scaling. Ensures your steam equipment stays corrosion-free and efficient.

STEAM BLANKET: NO ROOM FOR GASES

Maintains a steam layer over stored water to prevent gas reabsorption and save reheating energy.



BENEFITS



ENERGY RECOVERY AND SAVINGS: EFFICIENCY THAT PAYS OFF

Maximizes energy efficiency by capturing energy from flash steam and condensate. Preheats feedwater to ~105-180 °C, reducing the energy required to bring water to boiler temperature, lowering fuel consumption, and minimizing operational costs.



CORROSION-FREE OPERATIONS: PROTECT YOUR INVESTMENT

Minimize corrosion by lowering dissolved oxygen to as low as 7 parts per billion, extending the life of high-pressure boilers and critical equipment.



LOWER CHEMICAL COSTS: FEWER ADDITIVES, MORE SAVINGS

Reduce or eliminate the need for oxygen-scavenging chemicals such as sodium sulphite or hydrazine, cutting both operational costs and environmental impact.



COMPACT AND SPACE-SAVING DESIGN

Utilize a high-efficiency Spray system to achieve top-tier performance in a smaller footprint, ideal for facilities with limited space.



ADAPTABILITY FOR VARYING LOADS

Whether high make-up water volumes or high condensate returns—With a high turndown ratio of up to 5:1, it maintains performance during peak and low-demand periods.



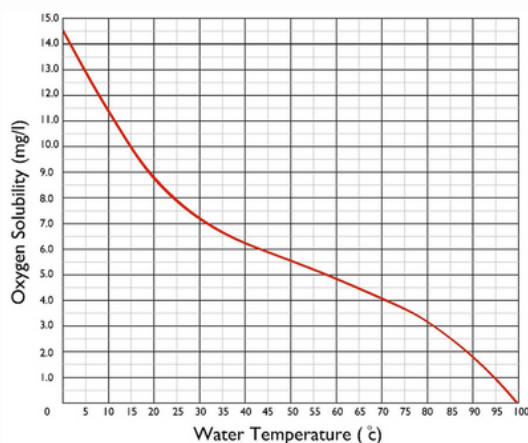
INTEGRATED WATER STORAGE & NPSH

Provide 10-20 minutes of water storage capacity and the net positive suction head (NPSH) required for reliable boiler feed pump operation even during demand surges or fluctuations.



THERMAL SHOCK PREVENTION: SMOOTH AND SAFE PERFORMANCE

Operate at temperatures from 105°C up to 180°C to lessen thermal stress on downstream equipment and protect boilers from premature wear.



WHY IS IT NEEDED?

Dissolved gases like oxygen, carbon dioxide, and ammonia enter the boiler system primarily through makeup water—which can contain up to 8 mg/L (8,000 ppb) of oxygen—and from the condensate return side via air leaks or vacuum operations.

Even small amounts (as little as 10–100 ppb) can trigger severe, localized “pitting” corrosion, especially at higher water temperatures where reactions accelerate. Such corrosion damages metal surfaces, reduces efficiency, and can lead to costly failures.

A properly designed deaerator tackles this challenge by mechanically stripping out dissolved gases, commonly reducing oxygen to below 7 ppb. This nearly complete removal helps prevent pitting, lowers overall corrosion, and avoids harmful deposits on heat-transfer surfaces.

At the same time, deaerators raise feedwater temperature (102°C–180°C), boosting thermal efficiency, reducing fuel consumption, and ensuring adequate net positive suction head (NPSH) for feed pumps.

By handling fluctuating loads and recovering energy from flash steam and condensate, deaerators significantly lower chemical usage, maintenance, and operating expenses—ultimately improving reliability and extending equipment life.



HOW DOES IT WORK?

PROCESS STEP	DESCRIPTION
SPRAY SECTION (PRIMARY DEAERATION)	Water is atomized into fine droplets using high-efficiency nozzles to maximize steam contact.
	Removes 90%-95% of dissolved gases, including oxygen.
PREHEATING WITH STEAM	Steam heats water to saturation temperature (~100°C at 1 atm).
	Solubility of gases decreases, and 97%-98% of oxygen is vented out.
HOLDING SECTION (FINAL DEAERATION)	Water flows over stainless steel baffles for final gas scrubbing.
	Oxygen levels reduced to as low as 7 parts per billion (ppb).
GAS VENTING	Non-condensable gases, such as oxygen and carbon dioxide, are vented through air vents.
RETENTION AND MIXING	Ensures adequate retention time for thorough mixing of water and steam.
HENRY'S LAW IN ACTION	As temperature rises, the partial pressure of gases decreases.
	High temperatures & steam blanket allow effective gas removal
ENERGY RECOVERY	Captures energy from flash steam and condensate, reducing live steam usage.
	Steam losses limited to 2-5% of conventional venting type design.
CHEMICAL DEAERATION	Residual oxygen removed with chemical treatments like sodium sulfite or hydrazine.
	Complements mechanical deaeration for high-pressure boilers
PRESSURE AND TEMPERATURE CONTROL	Pressure & temperature are independently controlled
	Modulating steam valve ensures stable pressure and temperature even in fluctuating load.

DESIGN HIGHLIGHT

TWO-STAGE DEAERATION

Preheating Stage: High-efficiency nozzles atomize feedwater into fine droplets, quickly releasing up to 90–95% of dissolved gases.

Tray Section: Final stripping reduces oxygen to as low as 7 ppb, ensuring minimal corrosion risk.

COUNTERFLOW STEAM DESIGN

Steam moves opposite to the water flow, maximizing heat transfer.

STEAM BLANKET STORAGE

Deaerated water is stored under a constant steam layer, preventing reabsorption of gases. Maintains water temperature at 105°C–180°C to reduce thermal shock and boost efficiency.

THERMOSTATIC AIR VENTING

Thermostatic air vents remove non-condensable gases (e.g., oxygen, nitrogen) continuously. Prevents steam losses by venting only when necessary.

MODULATING CONTROL VALVES

Automatically adjust water level and steam flow, maintaining stable pressure & temperature provide reliable operation under fluctuating loads or variable feedwater conditions.

ROBUST STAINLESS STEEL CONSTRUCTION

95% of Oxygen is removed in dome & nozzles made of stainless steel spray to prevent corrosion, this reduces maintenance expenses and unplanned shutdowns.

COMPACT, MODULAR LAYOUT

Fits tight spaces without compromising performance. Scalable design adapts to retrofit existing feed water tanks.

FLEXIBLE OPERATION

Handles large make-up water volumes or high condensate returns.
Offers a high turndown ratio for both peak and low-demand conditions.



BEFORE



AFTER

OUR DEAERATOR

SPRAY NOZZLE DEAERATOR BASICS

A spray nozzle (spray-type) deaerator removes dissolved gases (primarily oxygen and CO₂) from boiler feedwater using near-saturated steam (around 0.2 bar, or 20 kPa). By heating the water close to saturation—often within about 3°C—gas solubility plummets, preventing corrosion and prolonging equipment life.

FINE DROPLET FORMATION

Feedwater enters through spring-loaded nozzles, forming droplets typically under 1 mm in diameter. This vastly increases surface area, allowing steam to heat the water quickly and release most dissolved gases.

FAST GAS REMOVAL & STORAGE

Stripped gases rise with the steam and exit through thermostatic air vents in under 10 seconds. Any residual gas is scrubbed out in the Baffle section before the water settles in a storage chamber, where it remains near saturation temperature to minimize reabsorption until entering the boiler. With correct venting rates and steam flow, oxygen content can be reduced to around 7 micrograms per litre (7 µg/L)



GENERAL PERFORMANCE & TECHNICAL SPECIFICATIONS

GENERAL PERFORMANCE OF PRESSURIZED DEAERATOR

FEATURE	DETAILS
Oxygen Removal Efficiency	Reduces oxygen to below 7 ppb
Operational Pressure & Temperature	Operates at 0.5 - 8 barg and heats feedwater to 105 - 180°C
Storage Capacity	Provides 10–20 minutes of stored deaerated water at full load
Steam Efficiency	Steam consumption: 50-100 kg per 1,000 kg of feedwater
Performance in Fluctuating Loads	Handles a turndown ratio of up to 5:1
Vent Rate for Gas Discharge	Gases are vented along with 0.5 - 2 kg of steam/1,000 kg capacity
Water-to-Steam Contact	High-efficiency spray nozzles maximize surface area for heat transfer and gas removal.
Compliance & Certification	Meets IBR / ASME standards for safety, performance, and durability.

TECHNICAL DETAILS OF PRESSURIZED DEAERATOR

FEATURE	DETAILS
Material Construction	Made of stainless steel for excellent corrosion resistance and durability.
Capacity Range	Handles 10,000–1,00,000 kg/hr of feedwater
Design Pressure	Rated for upto 10.5 barg for water temperature (~105 - 180°C).
Water Distribution System	Precision-engineered spray nozzles ensure even distribution and rapid heat transfer.
Maintenance Efficiency	Designed for long-term reliability with minimal maintenance requirements.
Durability	Resistant to oxidation, high temperatures, and chemical damage, extending equipment life.



CAPACITY CHART

The table below illustrates the operating flow rates, storage capacity, and steam requirements for various load conditions. These parameters ensure the deaerator meets the needs of different plant sizes and steam generation capacities.

FLOW RATE (KG/HR)	STEAM FLOW (KG/HR)	STORAGE CAPACITY (MINUTES)	STEAM PRESSURE (BARG)	STEAM TEMPERATURE (°C)
10,000	500	10	0.2	105
25,000	1,250	10	0.2	105
50,000	2,500	10	0.2	105
75,000	3,750	10	0.2	105
1,00,000	5,000	10	0.2	105



MONITORING & MAINTENANCE

MONITORING

Oxygen Levels: Ensures oxygen levels are reduced to below 7 ppb using continuous monitoring with online oxygen meters.

Dissolved Oxygen Testing:

Indigo Carmine : Measures oxygen in the range of 0–100 ppb.

Amperometric Tests : Rapid analysis for oxygen up to 1 ppm.

Oxygen Analyzers : Direct, reliable measurement in liquid streams.

Regular Checks: Verify system performance by temporarily stopping chemical oxygen scavenger feed and monitoring results.

Spot Inspections: Monitor key parameters like pressure, temperature, and vent operation daily for anomalies.

MAINTENANCE

Annual Inspections:

Visual inspection of internal components for corrosion, scale, and cracks.

Non-destructive testing (NDT) of welds using ultrasonic, dye penetrant, or magnetic particle testing.

Key Component Checks:

Inspect and clean spray nozzles under hydrostatic pressure.

Test and calibrate level floats, sensors, and relief devices.

Verify inlet valves, safety relief valves, and overflow controllers.

Daily and Frequent Tasks:

Perform daily visual inspections for leaks, abnormal sounds, and vent flow.

Check and log pressure, temperature, and feedwater tank levels.

Analyze feedwater for oxygen and carbon dioxide levels to detect system inefficiencies.

INDUSTRIES WE SERVE



BREWERY



CHEMICAL



CORRUGATOR



DAIRY



F & B



OIL & GAS



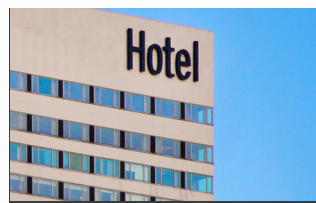
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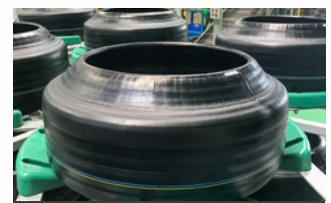
PLYWOOD



HOTEL



TEXTILE



TYRE





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