

Beverage (Carbonated Drinks) - De-aeration

Sugar Dissolving

De-aeration

Blending

Pasteurisation

Carbonation

Filling & Packaging

Utilities

Deaeration is the second unit in this seven step overview of beverage (carbonated drinks)

Deaeration Process Description

All beverages are sensitive to dissolved oxygen. Taste, colour, vitamin retention and shelf-life can be substantially affected. Additionally, dissolved oxygen adversely affects filler performance and causes excess filler foaming, resulting in poor fill-volume control.

Different technologies are used for water de-aeration, depending on the specific application:

- Pressure de-aeration
- Vacuum de-aeration
- Combined pressure/vacuum de-aeration

With pressure de-aeration, oxygen and nitrogen are extracted from the water by adding CO₂. Pressure de-aeration is used for de-aerating waters with a particularly low CO₂ content.

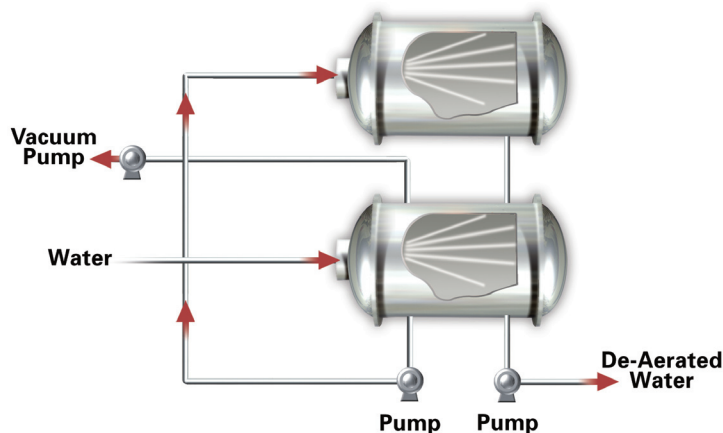
Vacuum de-aeration is based on creating a vacuum pressure in the de-aeration tank. Water is sprayed into the de-aeration tank, whilst oxygen and nitrogen are extracted from the water and sucked out of the tank.

If a liquid ring pump is added to the pressure de-aeration system, pressure or vacuum de-aeration can be performed within one line.

In this process, water is fed to a horizontal tank via a specially designed spray plate, which produces a large surface area of water for gas transfer. The tank is maintained under constant vacuum to remove oxygen. Single stage de-aeration can achieve residual oxygen levels of 0.5 mg/l., but dual stage processes, using two de-aeration tanks, can be used to reduce residual oxygen to 0.03 mg/l or less. In the latter, stripping gas (CO₂ or N₂) can be added as required. This helps to prevent the O₂ dissolving in the water. The remaining gases are removed in the second de-aeration tank.

De-aerated water is discharged from the tank with a manual or pneumatic regulating valve. It is also common to feed a buffer tank where the contents level controls the operation of the de-aeration unit.

Select Critical Control Points of Deaeration



De-aeration Vessel Level

Liquid level is monitored to confirm the vessel contents volume and provide fill and empty alarm points for the de-aerated water.

Dissolved Oxygen Level

Minimum oxygen levels are desired to maintain optimum product quality and maximise shelf-life.

De-aeration Vessel Pressure Control

Control of the vacuum pressure applied to the vessel ensures a constant pressure during de-aeration.

Water Temperature

Water feed temperature is monitored for consistent optimum de-aeration.

Improving Beverage Efficiency

Recommended Product Solution

De-aeration Vessel Level	Rosemount 3051S
<p>Control Point Challenge: Accurate measurement of the contents of the vessel throughout the production process.</p> <p>Solution: Hygienic pressure transmitters provide accurate vessel hydrostatic head measurement using 4-20mA with HART protocol direct to the control system. Provides level alarm function as well as contents monitoring.</p>	 <ul style="list-style-type: none"> • dP with remote seals • +/- 0.065% accuracy • 4-20mA + HART • Tuned capillary system • 5 years stability
Dissolved Oxygen	Rosemount Analytical Bx438
<p>Control Point Challenge: Accurate measurement and control of the dissolved oxygen level in the de-aerated water. This is essential to ensure consistent flavour, colour and shelf-life.</p> <p>Solution: Amperometric sensors accurately measure dissolved oxygen from low ppb to ppm levels to ensure the final product has minimal levels of residual oxygen.</p>	 <ul style="list-style-type: none"> • Range 0-20 ppb • Lower detectable limits < 5 ppb • Robust membrane – CIP cycles • No O₂ offset readings due to CO₂ effects
De-aeration Vessel Pressure Control	Rosemount 3051S
<p>Control Point Challenge: Accurate control of vacuum pressure throughout the production process ensures consistent O2 removal.</p> <p>Solution: Hygienic pressure transmitters provide accurate vessel hydrostatic head measurement using 4-20mA with HART protocol direct to the control system. Provides level alarm function as well as contents monitoring.</p>	 <ul style="list-style-type: none"> • dP with remote seals • +/- 0.065% accuracy • 4-20mA + HART • Tuned capillary system • 5 years stability
Water Temperature	Rosemount 644 Temperature
<p>Control Point Challenge: Water feed temperature is monitored for consistent optimum de-aeration conditions.</p> <p>Solution: Reliable and accurate temperature measurement is achieved by replacing direct-wired sensors to the control system by sensor-mounted temperature transmitters using 4-20mA with HART protocol. RTD Pt-100 offers the highest accuracy and linearity and the use of transmitters provides a clean signal to the temperature controller.</p>	 <ul style="list-style-type: none"> • Universal RTD/Thermocouple • 4-20mA + HART • 0.03°C accuracy • 2 year stability • Direct mount sensor