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 $\text{CO}_2$. Pressure de-aeration is used for de-aerating waters with a particularly low $\text{CO}_2$ 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 ($\text{CO}_2$ or $\text{N}_2$) can be added as required. This helps to prevent the $\text{O}_2$ 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

### De-aeration Vessel Level

**Control Point Challenge:** Accurate measurement of the contents of the vessel throughout the production process.

**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.

### Dissolved Oxygen

**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.

**Solution:** Amperometric sensors accurately measure dissolved oxygen from low ppb to ppm levels to ensure the final product has minimal levels of residual oxygen.

### De-aeration Vessel Pressure Control

**Control Point Challenge:** Accurate control of vacuum pressure throughout the production process ensures consistent O2 removal.

**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.

### Water Temperature

**Control Point Challenge:** Water feed temperature is monitored for consistent optimum de-aeration conditions.

**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.

## Recommended Product Solution

### Rosemount 3051S

- dP with remote seals
- +/- 0.065% accuracy
- 4-20mA + HART
- Tuned capillary system
- 5 years stability

### Rosemount Analytical Bx438

- Range 0-20 ppb
- Lower detectable limits < 5 ppb
- Robust membrane – CIP cycles
- No O₂ offset readings due to CO₂ effects

### Rosemount 3051S

- dP with remote seals
- +/- 0.065% accuracy
- 4-20mA + HART
- Tuned capillary system
- 5 years stability

### Rosemount 644 Temperature

- Universal RTD/Thermocouple
- 4-20mA + HART
- 0.03°C accuracy
- 2 year stability
- Direct mount sensor