

Oxi_Out

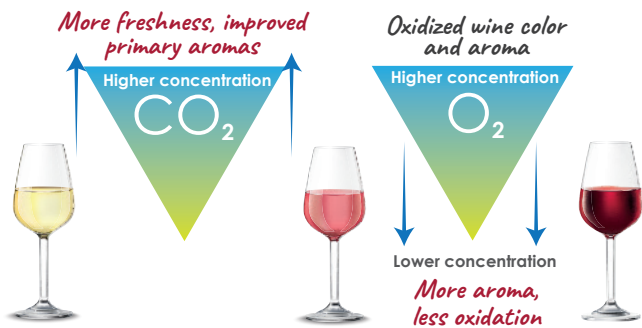
*A different way of managing
gas in winemaking*



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A different way of managing gas in winemaking



Technology: Membrane Contactors

There are numerous methodologies for controlling the gases dissolved in wine prior to bottling, but the development of membrane contactor technology has now turned them into a highly effective tool at an industrial level.

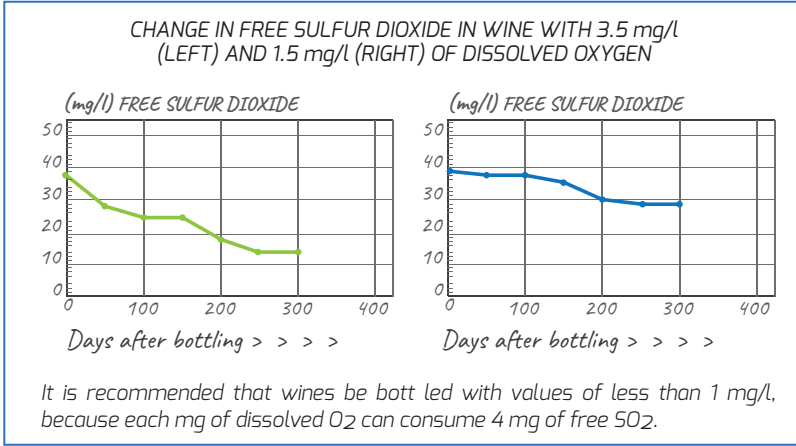
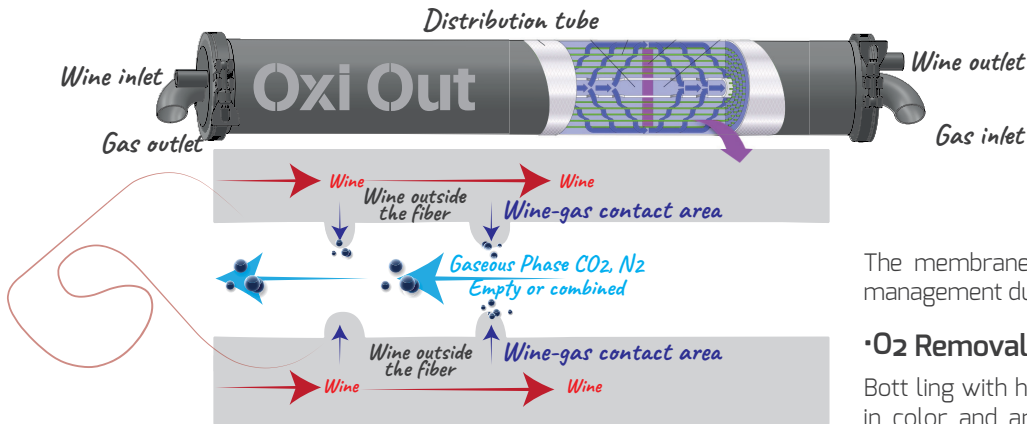
Contactors are cylindrical structures formed by thousands of highly hydrophobic microporous hollow fibers made of food-grade polypropylene. Each fiber has an inner diameter of 200 µm. and an outer diameter of 300 µm., with a pore diameter of 0.03 µm.. This small pore size only allows gases with a low molecular weight (like O2, CO2 and N2) to pass through.

The principle by which contactors work is simple. Due to the membrane's hydrophobic nature, the wine never comes into contact with the inert gas, as the membrane acts as a barrier between the liquid and gas phases. By adjusting the partial pressure of the gas, the gases dissolved in wine can be selectively removed or preserved in dissolved form, a process governed by Henry's Law.

The following variables affect the output of the process:

- Flow rate of the wine.
- Flow rate of inert gas.
- Initial concentration of gases.
- Temperature.
- Gas pressure.

The wine circulates outside the sieve in the opposite direction of the inert gas being used (N2 or CO2) to improve the use of the gases in the most effective way.



Gas management in winemaking has a substantial impact on the quality of bottled wines. Too much oxygen can speed up wine oxidation, while too little can reduce typicity due to the presence of reductive processes that mask the fruit aromas. Effective carbon dioxide management, meanwhile, enhances the freshness of white and rosé wines and tones down the aggressiveness of more astringent wines.

Henry's Law

The gas exchange capacity of the membrane contactors is defined by Henry's Law; "At a constant temperature, the amount of a gas dissolved in a liquid is directly proportional to the partial pressure of that gas on the liquid."

C = P·KH

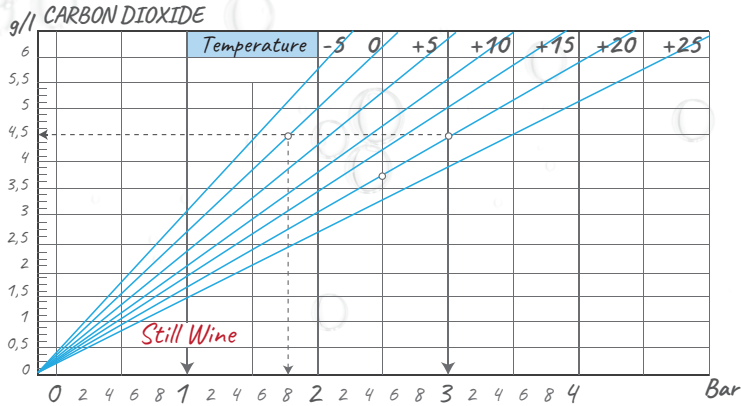
- C: Concentration of gas (solubility)
- P: Partial pressure of the gas
- KH: Henry's Law constant

Removal and addition of CO2

Managing carbon dioxide in wine is complicated due to its high solubility and temperature dependence. However, the use of membrane contactors makes it possible to accurately and efficiently adjust CO2 to optimal levels during bottling.

Red wines	White and rosé wines
400/800 mg/l	Hasta 2500 mg/l

- Bottling: Up to 40% lower levels of dissolved CO2.
- Bottling: Up to a 2.4 g/l increase in CO2 at atmospheric pressure.



Oxi_Out

uses membrane contactor technology for the precise management of dissolved gases. Its components tell us the exact O2 and CO2 levels online, along with the system pressure and the temperature at which the process is being carried out.

CO2 sensors

Oxi_Out uses a dissolved carbon dioxide sensor at the equipment outlet. The measurement is carried out by first determining the temperature and pressure and then converting the measured values into their concentration levels, expressed as g/l.



O2 sensors

Oxygen is measured at the equipment inlet and outlet by means of luminescence, which is also known as LDO technology. Compared to electrochemical sensors, the measurements are more reliable and accurate because no oxygen is consumed during the process, the probes are more resistant to dirt deposits, and the wine's flow rate does not affect the reliability of the values.

It is important to remove the probes during the sterilization process because they are temperature-sensitive and cannot withstand temperatures above 50°C.



Specifications:

The various Oxi_Out equipment models permit adjustment to the winery's work output.

	Oxi_Out 60	Oxi_Out 120	Oxi_Out 500
Machine dimensions (cm)	150x150x75	150x150x75	160x160x105
Maximum work flow rate (l/h)	6.000	12.000	50.000
Maximum wine pressure (bar)	6	6	5
Maximum gas pressure (bar)	5	5	4
Active surface area (m²)	20	40	140

The equipment's simple operation means that we can work from a touchscreen where we can identify the work mode we need, based on the process objective.

WORK MODE	GAS USED	OBJECTIVE
Extraction	N2/CO2	Oxygen removal.
Vacuum	-	Oxygen and carbon dioxide removal.
Gasification	N2/CO2	Addition of carbon dioxide or nitrogen.

The process of cleaning, drying, and sanitizing is carried out quickly and efficiently along with bottling, at no additional cost for the winery.

WORK MODE	GAS/LÍQUID USED	OBSERVATIONS
Cleaning	Water + chemical cleaning	Prepare carefully with the concentrations indicated in the corresponding manual.
Drying	Air/nitrogen	Dehumidified gas should be used, free of oils and particles.
Sanitizing	Hot water (up to 80°C)	The cleaning option must be activated to prevent the membrane from getting wet.

The membrane contactors are especially suitable for gas management during bottling and other stages of production.

O2 Removal

Bottling with high levels of dissolved O2 leads to problems in color and aroma development. Browning and oxidation aromas quickly appear, as SO2 rapidly forms compounds and loses its protective capacity.

The use of membrane contactors during winemaking helps to reduce the amount of dissolved oxygen, keeping wines protected even with lower SO2 levels. Their use is particularly helpful during:

- Bottling: up to 80% lower levels of dissolved O2 present in the wine.
- Loading and unloading of tanks.
- Wine inerting step: saturation with 50% less N2 compared to the use of bubblers.
- Barrel transfer: up to 6 mg/l decrease in dissolved O2.