

3M Separation and Purification Sciences Division

Efficient, economic, fast: membrane-based technology for gas content management in wine

A system component elevates wineries to a new production level

Gas management is crucial in wine production:

- Carbon dioxide (CO₂) has a large impact on taste, and there are trade demands on specific values of CO₂ content in the bottled wines
- Oxygen (O₂) content affects the aging process and therefore needs to be precisely controlled to ensure consistently high-quality production

Membrane contactors allow fast and precise dissolved gas management and help to reduce gas consumption. In some cases, an alcohol content that's too high can have a negative impact on wine including taste and marketability. Membrane contactors allow a smooth reduction of alcohol content.

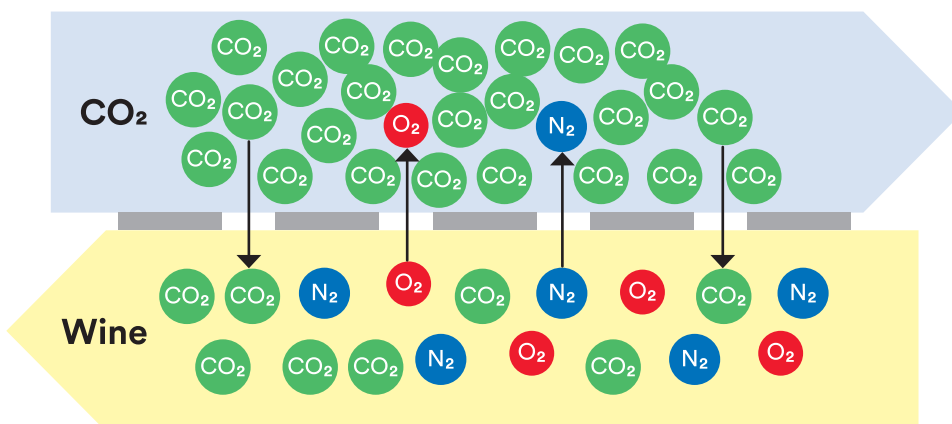
The innovative solution: 3M™ Liqui-Cel™ Membrane Contactors for dissolved gas management systems

3M is the manufacturer of 3M™ Liqui-Cel™ Membrane Contactors – the core components of dissolved gas management systems which are manufactured, supplied and maintained by our OEM customers. Liqui-Cel membrane contactors allow for fast deoxygenation, carbonization or decarbonization of wine in just one step, and grant quality, taste and stability to the product. CO₂ and O₂ levels can be adjusted to a desired level, which means that gasses can be added or removed easily.

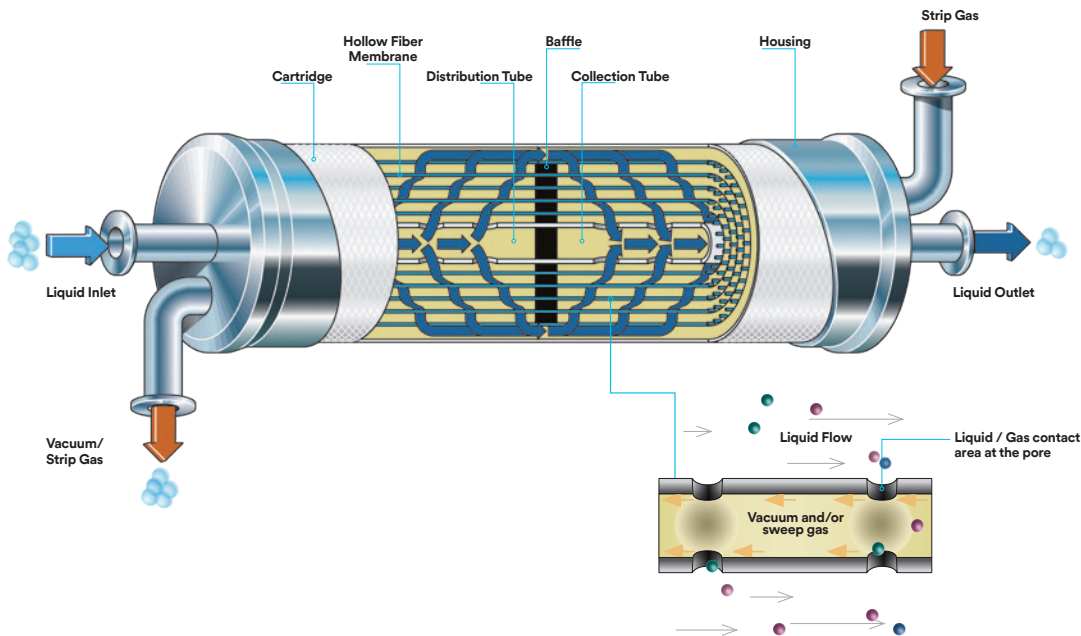
Gas management systems with Liqui-Cel membrane contactors inside are available from different system manufacturers.

How does it work?

Liqui-Cel membrane contactors allow mass transfer between two fluids: wine runs on one side of the membrane, gas or vacuum on the other. The membrane is hydrophobic with very small pores, so the wine does not pass through.



Schematic representation of mass transfer with membrane contactors, in this case O₂ (and N₂) removal and CO₂ adding



Cut drawing of 3M™ Liqui-Cel™ membrane contractor for O₂ and CO₂ removal or adding in wine

This cut drawing shows the basic functioning of 3M™ Liqui-Cel™ membrane contractors during the regulation of gas

A membrane-based gas management system can use sensors to provide the automated measuring of CO₂ and O₂ concentration. Such control systems facilitate precise operation directly upstream to the bottling line. 3M™ Liqui-Cel™ membrane contactors can also be implemented between two tanks with less demand for online control. The appropriate cleaning and maintenance may be arranged either automatically or manually.

Are you also looking for a solution to manage alcohol levels? In a different system configuration, the same Liqui-Cel membrane contactors can be also used to adjust alcohol content in wine.

Automation and productivity features

In combination with appropriate sensors and controls, Liqui-Cel Membrane Contactors can enhance your productivity with:

- Automated processes to reach desired gas level without any manual intervention
- Automated adaption to changing feed conditions
- Automated cleaning, drying and conservation of the membrane

Very beneficial: independent control

The implementation of the hydrophobic membranes in between the wine and gas phase allow an independent control of the gas pressure. By this measure, CO₂ and O₂ may be reduced in the wine without overloading with N₂.

CO₂ may be added bubble-free as the gas pressure will always be adjusted lower than the wine pressure.

Cleaning and Maintenance

Large plants and systems have mostly implemented automated cleaning processes for maintenance. In smaller wineries, the operator has to take care of cleaning processes manually in order to maintain system performance and product quality.

The following points must be considered when cleaning:

- The dedicated Liqui-Cel membrane contactors can withstand hot water sanitization till 85°C
- Pure strong caustic and/or acid may be applied for cleaning without limitations
- Oxidizing agents should not be applied as they will shorten membrane life time
- Solvents or surfactants can wet-out membrane pores.

Successful implementation in real production environments

3M™ Liqui-Cel™ technology has been implemented to great success in France, where a famous winery has been using two automated gas management systems in its bottling plant for five years. The systems can reach oxygen threshold level of 0.2 mg/l in one step and grant finesse of bubbles for freshness and quality. Low fruitiness, which is a known issue of harvests from September on, can be countered easily, and wines can achieve new brilliant colors and aroma.

The production manager is particularly impressed with the operator friendliness of the system and its ease in programming and maintenance. Since commissioning, it works reliably with repeatable, high-quality results and without any down-times due to clogging.

Economic, efficient, fast: The right solution for your wine production

Liqui-Cel membrane contactors allow for fast and efficient management of dissolved gas concentration in one step. With a high operator friendliness and automated maintenance and processes, you have an economic solution for your wine production. Exact adjustments of desired gas levels will free you from quality issues.

Call our 3M experts for consultancy, to see if our OEMs can offer you a complete solution.

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