



Liqui-Cel™
Membrane Contactors

**Fast.
Efficient.
Precise
control.**

**3M™ Liqui-Cel™
Membrane Contactors**

Dissolved gas control solutions
for the beverage industry

Smooth. Sparkling. Purely satisfying.



We owe some of the sparkle, taste and texture of our favorite drinks to dissolved gases. Whether removing oxygen to help extend shelf life or adding fizz, gas control systems help the beverage industry improve product quality from the first sip to the last drop.

Total dissolved gas control

Capable of both adding and removing gases to liquids, 3M™ Liqui-Cel™ Membrane Contactors provide a versatile, compact, in-line solution that delivers rapid deoxygenation, decarbonation, carbonation, and nitrogenation of liquids to precise concentration levels. Applying this advanced membrane-based science in your production processes can help increase operating efficiency and reduce guesswork while maintaining or improving product quality, consistency and stability.

Compact and versatile:

- Allows for installation in space-limited locations
- May reduce or eliminate construction and expansion costs
- Can be mobile and used in multiple process steps

Rapid in-line gas control:

- May eliminate need for tanks or pumps
- Can reduce fabrication work and simplify production
- Reduces hold-up time in gas absorption, speeding up production

Predictable and precise:

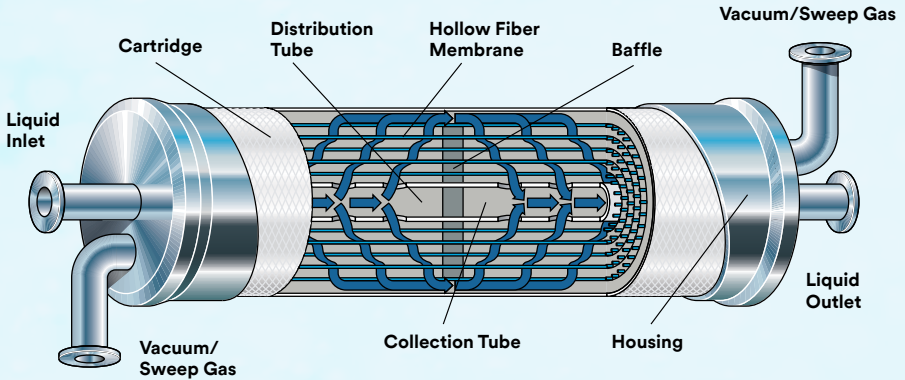
- Gas concentrations can be precisely controlled to consistently meet target specifications
- Bubble-free gas injection helps with product and beer head stability

High performance and efficient:

- Can reach 1 ppb oxygen to help protect product quality and reduce risk of can corrosion
- Smaller pumps and efficient use of sweep gases may lower operating costs

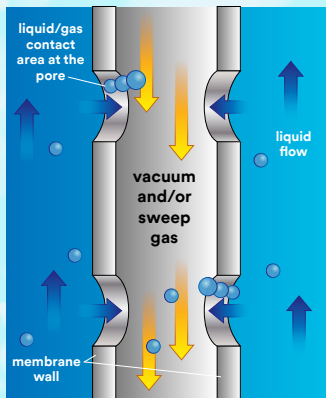
Modular design:

- Skids can be scaled up to meet future expansion needs

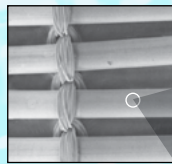


Advanced membrane technology

Liquid flows around the outside (shellside) of the hollow fiber while a vacuum or sweep gas is applied to the inside (lumenside) of the fiber. Applying the vacuum or sweep gas creates a difference in gas concentration that drives the rapid transfer of gases into or out of the liquid with exceptional precision.



The micropores in the wall of the hollow fiber membrane provide a large surface area for efficient gas transfer in a small space. The small size of 3M™ Liqui-Cel™ Membrane Contactors enables the construction of small systems that can be scaled to meet changing flow requirements.



Hollow fiber membrane array



Hollow fiber



Hydrophobic membrane with pores approx. 0.03 μm

The hydrophobic membrane and small pore sizes keep water from passing into the gas stream.

Soft drinks. Coffee. Tea.

Better flavor and bigger yields.



- Blending water deaeration
- Bulk deaeration
- Deaeration at filling/rinse water
- Point-of-use gas control

Deoxygenation

Removing dissolved O_2 from blending and process water helps prevent spoilage and may extend the shelf life of soft drinks, coffees, teas and other beverages. Low oxygen levels also help reduce risks of can corrosion and improve process efficiency and energy use in cold-fill applications.

3M™ Liqui-Cel™ Membrane Contactors can reduce O_2 to industry-leading levels of 1 ppb. This compact, low maintenance solution to dissolved oxygen may be the answer you need to protect your product and improve yield.

Carbon dioxide and nitrogen control

Beverage producers require precise control of carbon dioxide to produce distinctive flavor and fizz. They are also increasingly relying on precise nitrogenation of coffee. Liqui-Cel membrane contactors can operate in-line, allowing for rapid infusion of dissolved gases in a controlled way.

Beer and Wine.

Freshness, foam, and flavor.

Deoxygenation

Oxygen in wine and beer accelerates spoilage and shortens shelf life. 3M™ Liqui-Cel™ Membrane Contactors can reduce O_2 in wine and its impact on aroma and taste without using chemicals. In brewing, deoxygenated water is commonly used for diluting beer concentrate, pushing water, and centrifuge seal water to prevent oxygen pick-up and protect product quality.

Carbonation, decarbonation and nitrogenation

Carbon dioxide and nitrogen impact product taste, mouthfeel and appearance. Liqui-Cel membrane contactors provide a bubble-free in-line solution that can rapidly infuse gases to water, beer and wine with precision and predictability. Applying this advanced membrane-based science in your production process may help increase operating efficiency and reduce guesswork while maintaining or improving product quality, consistency and stability.

Liqui-Cel membrane contactors can also be used to decarbonate wine and beer to achieve desired taste and texture.



- Deaeration of bulk water
- Deaeration of blending/dilution water
- Nitrogenation
- Deoxygenation of seal water
- Deoxygenation of pushing water in breweries

Efficiency at every stage of dissolved gas control.



Compact and versatile



- Allows for installation in space-limited locations
- May reduce or eliminate construction and expansion costs
- Can be mobile and used in multiple process steps

Rapid in-line gas control



- May eliminate need for tanks or pumps
- Can reduce fabrication work and simplify production
- Reduces hold-up time in gas absorption, speeding up production

Predictable and precise



- Gas concentrations can be precisely controlled to consistently meet target specifications
- Bubble-free gas injection helps with product and beer head stability

High performance and efficient



- Can reach 1 ppb oxygen to help protect product quality and reduce risk of can corrosion
- Smaller pumps and efficient use of sweep gases may lower operating costs

Modular design



- Skids can be scaled up to meet future expansion needs

A study in savings.

A blending system using 3M™ Liqui-Cel™ Membrane Contactors contributed to a North American soft drink plant saving over \$200,000 each year. After replacing vacuum + tank gas control systems with Liqui-Cel membrane contactors, the plant used less water and energy, decreased time and costs for maintenance, and significantly improved product quality and yield.

Operating Expense	Annual Savings
Production Downtime	\$17,000
Pump Energy	\$12,670
Thermal Energy	\$11,800
Maintenance	\$10,000
Water	\$440
+ <i>Increased Yield</i>	\$157,900
Total Annual Cost Savings:	\$209,810*

*Operating expenses and savings provided by the customer. Actual savings and operating expenses will vary according to each project.



Support at every step

With 3M™ Liqui-Cel™ Membrane Contactors technology in hundreds of applications around the globe, 3M has the knowledge and experience to support the design of your Liqui-Cel system.

Visit our website to download technical bulletins, mechanical drawings, case studies and more! 3M.com/Liqui-Cel

Technical Information: The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use: Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

Warranty, Limited Remedy, and Disclaimer: Unless an additional warranty is specifically stated on the applicable 3M product packaging or product literature, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

Limitation of Liability: Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.

3M and Liqui-Cel are trademarks of 3M Company. 2017 3M Company. All rights reserved.



**Separation and Purification
Sciences Division**
13840 South Lakes Drive
Charlotte, North Carolina
28273 USA
Phone: +1 980 859 5400

**3M Deutschland GmbH
Separation and Purification
Sciences Division**
Öhder Straße 28
42289 Wuppertal Germany
Phone: +49 202 6099 - 0

LC-1097
Rev. 03/2017

3M.com/Liqui-Cel