



DEOXYGENATION CARBONATION DECARBONATION
NITROGENATION ALCOHOL ADJUSTMENT

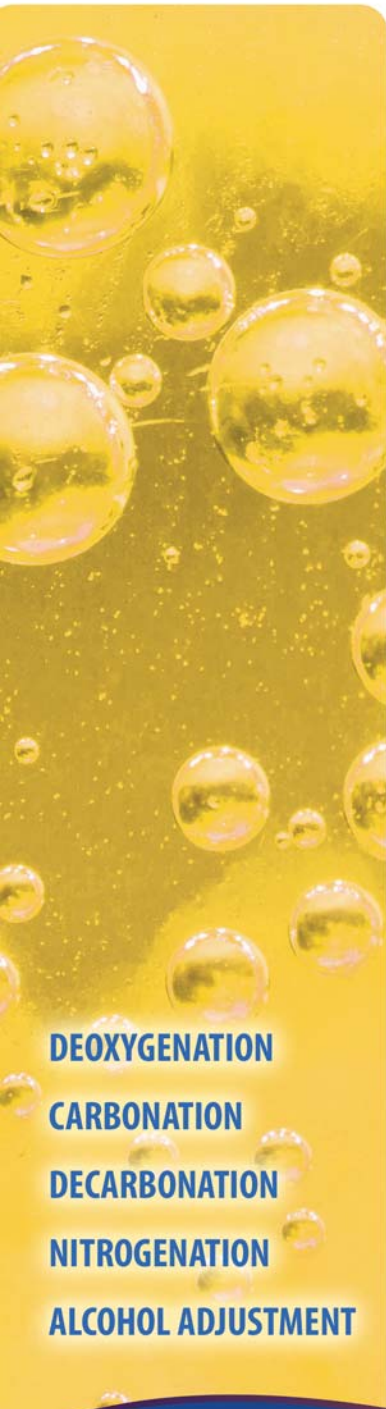


Liqui-Cel[®]
MEMBRANE CONTACTORS

**EFFICIENT DISSOLVED GAS CONTROL
FOR BEVERAGE PRODUCTION**

3M

3M.com/Liqui-Cel



CONVENIENCE AND VERSATILITY FOR DISSOLVED GAS CONTROL



- ▶ *Compact Design*
- ▶ *Modular*
- ▶ *In-line Operation*
- ▶ *Minimal Energy & Water Use*
- ▶ *Compatible For Retrofitting*
- ▶ *Offers Mobility For Easy Transport*

LET US HELP YOU MEET SUSTAINABILITY GOALS

- ▶ *Reduce Water Consumption*
- ▶ *Low CO₂ Use*

MEMBRANE TECHNOLOGY

Liqui-Cel® Membrane Contactors utilize a hydrophobic polypropylene membrane to remove dissolved gases from liquids. Water flows on one side of the membrane and a vacuum or strip gas is passed on the other side of the membrane. By controlling the pressures of gases in contact with the liquid, a highly efficient method for gas control can be achieved. Membrane contactors are widely accepted to control gas levels in liquids used in the soft drink and brewing industries.



Easy to install - Without major modification, continuous flow, no need for additional tanks and pumps



Engineered for Efficiency

Liquid enters the contactor and flows on the outside of the hollow fiber membranes. The center baffle forces water to flow radially across the hollow fibers. High contact area and unique internal design leads to highly efficient gas control.

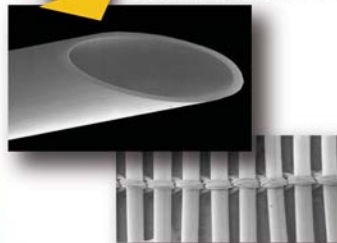
Minimal Energy Consumption

*No need to heat water and cool it down
Smaller and fewer vacuum pumps*

Low Pressure Drop

*Operates in-line under pressure
Eliminate repressurization pumps to reduce costs*

Hollow Fiber Membrane



APPLICATION AREAS - SOFT DRINKS

CONTROLLING DISSOLVED GASES MAY IMPROVE QUALITY, FLAVOR AND PROCESS YIELDS

- ▶ *Blending Water Deaeration*
- ▶ *Bulk Deaeration*
- ▶ *Syrup/Concentrate Degassing Before Blending*
- ▶ *Deaeration at Filling/Rinse Water*
- ▶ *Point of Use Gas Control*

Deoxygenation/Carbonation

In packaging plants, water and syrup are mixed prior to being bottled or canned. Oxygen is removed from process water prior to blending and filling.

Carbon dioxide can also be added to liquids for precise control of the CO₂ levels prior to packaging.

Deoxygenation of Water Used to Brew Canned Coffee/Tea

Flavor is improved if the water is first deoxygenated prior to brewing and packaging coffee and teas. Oxygen negatively impacts the taste and the shelf life of these products.

Deoxygenation of Water Used to Reconstitute Fruit Juices

Water blended with concentrated fruit juice should also be oxygen free. Oxygen will shorten shelf life and oxidize flavor components.



APPLICATION AREAS - BREWING & WINE PROCESSING

Bulk Deaeration & O₂ Removal from Dilution Water

Low levels of dissolved oxygen are desirable to protect product quality and ensure consistency. Oxygen can break down the final product if it is not removed from the process water used in the blending process. DO removal from dilution water in High Gravity Brewing is another common application.

O₂ Removal of Pushing Water & CO₂ Scrubbing Water

In breweries, large volumes of beer is left in diatomaceous earth (DE) filters and piping. In order to collect the product, the brewery will pump water through the system to push out the beer. Low O₂ concentrations are important because the product will absorb any gases present in the pushing water. Scrub water should also be deoxygenated to prevent oxygen from contaminating CO₂.

Deoxygenating Seal Water

During separation, water comes into contact with centrifuge seal water. Removing oxygen reduces the risk of reabsorption.

CO₂ Control of Beer

Adjust carbonation level in beer. CO₂ volume can be precisely controlled prior to packaging. CO₂ reclaimed from the fermentation process is scrubbed to remove contaminants (phenols, alcohol and other organics).

Nitrogenation of Beer

N₂ in beer production impacts "mouthfeel" and is used with stout beers and ales for head control.

Alcohol Adjustment

Alcohol concentration can be adjusted for taste and to meet regulatory guidelines.



BIG SAVINGS IN OPERATING COSTS

\$200,000 ANNUAL SAVINGS

by installing a blending system with Liqui-Cel®

- ▶ Combined savings in pump energy and water consumption was \$13,000 a year compared to vacuum + tank technology
- ▶ Energy savings by operating at higher temperature in fill line and reduced pump electrical energy use
- ▶ Lower production downtime - Yield improvement in product volume produced

Operating Expense	Savings
Pump Energy	\$12,672
Water Use	\$439
Thermal Energy	\$11,800
Production Downtime	\$17,000
Labor & Maintenance	\$10,000
Yield	\$157,900
Total Annual Cost Savings	\$210,000

Operating expenses and savings figures were provided by a carbonated soft drink plant in North America and represent the customer's internal estimates. Actual savings and applicable operating expenses can vary for each project.



INCREASE YOUR PRODUCTION EFFICIENCY

- ✓ *Reduce Water Use*
- ✓ *Improve Yield*
- ✓ *Minimize Downtime & Maintenance*



RELIABLE DISSOLVED GAS CONTROL

Liqui-Cel®
MEMBRANE CONTACTORS



ADVANTAGES OVER TRADITIONAL DEOX SYSTEMS

In-line operation



Allows for single point CO₂ addition or O₂/CO₂ removal
Low DO water for blending
Help reduce foaming and flavor loss

No dispersion



May improve product stability and help reduce foaming
from undissolved CO₂ microbubbles

Modular, compact system



Small footprint, easily adapts to capacity changes

Precise gas control



Rapid gas saturation
Better quality control
Easily adjust dissolved gas levels with logic controllers

**Low energy consumption – 7.5 HP needed to
run O₂ level below 10 ppb (250 gpm, 40 F)**



Reduce OPEX
No need to heat up water, then cool it down

Reduce hold up time



Higher production capacity

Compatible for retrofitting



Avoid expensive system upgrades



Contact Us Today To Discuss Your Application

Warranty, Limited Remedy, and Disclaimer: 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. 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. 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, Membrana and Liqui-Cel are trademarks of 3M Company.

©2015 3M Company. All rights reserved. (SB102)

3M

Industrial Business Group
Membranes Business Unit
13840 South Lakes Drive
Charlotte, North Carolina 28273
USA

Phone: +1 704 587 8888
Fax: +1 704 587 8610

3M Deutschland GmbH
Membranes Business Unit
Öhder Straße 28
42289 Wuppertal
Germany

Phone: +49 202 6099 - 658
Fax: +49 202 6099 - 750

3M Japan Ltd.
Membranes Business Unit
6-7-29, Kita-Shinagawa,
Shinagawa-ku, Tokyo 141-8684
Japan

Phone: +81 3 6409 5732
Fax: +81 3 6409 5827



ISO 9001

MEMBRANA
Now proudly part of 3M

3M.com/Liqui-Cel