



# Membrane Degasification - Chemical-Free Alternative For The Pharmaceutical Industry

## Technology for the Removal of Dissolved Gases

In treating water for the production of pharmaceuticals, the concentration of gases dissolved in the water plays an important role.

In many cases the CO<sub>2</sub> content in the raw water has to be further reduced to obtain purified water with a conductivity of <1.3 μS/cm (at a temperature of 25°C).

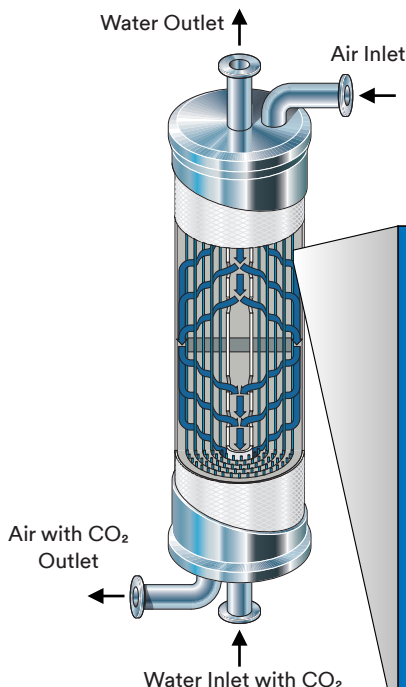


Contactors in an 8 m<sup>3</sup>/h ROCEDIS plant

Historically, NaOH dosing has been used to control CO<sub>2</sub>. With chemical dosing, CO<sub>2</sub> is converted into a carbonate, which can be removed by the RO. The latest state-of-the-art technology for this task is membrane degasification, where chemicals are not needed in membrane contactor operation.

## Design and Function

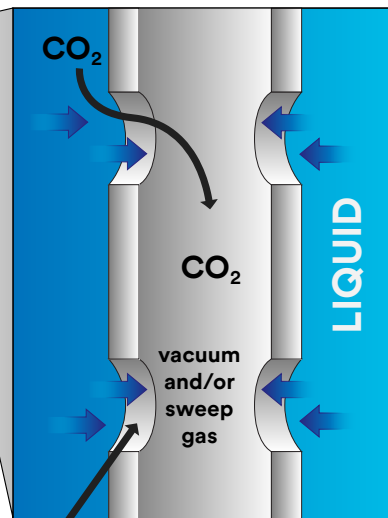
ONDEO Industrial Solutions - Hager + Elsässer, is an OEM that specifies 3M™ Liqui-Cel™ Membrane Contactors for CO<sub>2</sub> removal for pharmaceutical water systems.



These system designs place the membrane degasification system downstream of the RO system and before an EDI system. (See the flow diagram on the following page.)

A polypropylene hollow fiber membrane is used to put a gas and liquid phase in direct contact with each other. Because the fiber is hydrophobic, the liquid will not penetrate the pore. A strip gas or vacuum used on the inside of the hollow fiber lowers the partial pressure of the gas phase, which causes the gases to diffuse from the liquid phase through the membrane wall into the gas phase. The removed CO<sub>2</sub> is continuously swept out of the contactor by the air sweep.

Hollow fiber membrane contactors maximize the surface contact area for efficient, chemical-free CO<sub>2</sub> removal.



Liquid/Gas contact at the pore

## Advantages

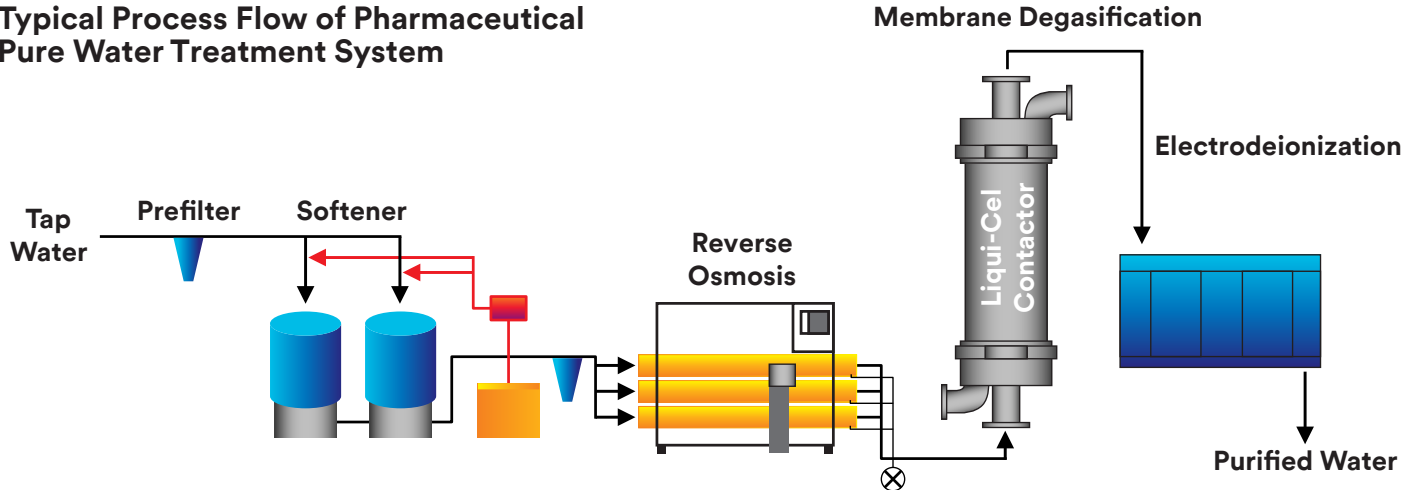
- Chemical free, “no added substances”
- Continuous operation
- Compact design
- Easy to expand due to modular design
- Reduction in operating costs

Hager + Elsässer has been integrating membrane degasification in their pharmaceutical water treatment systems since 1996.

90,000 m<sup>3</sup>/h (400,000 gpm) of water have been treated with membrane contactors.

For additional information, please contact your 3M representative or visit [3M.com/Liqui-Cel](http://3M.com/Liqui-Cel).

## Typical Process Flow of Pharmaceutical Pure Water Treatment System



Flow diagram of the plant design to produce Purified Pharmaceutical Grade Water per US and European Pharmacopoeia Requirements

Produced in conjunction with ONDEO Industrial Solutions GmbH - Hager+Elsässer Centre of Excellence. For more information, visit [www.hager-elsaesser.com](http://www.hager-elsaesser.com)

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ISO 9001



**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**  
 Önder Straße 28  
 42289 Wuppertal Germany  
 Phone: +49 202 6099 - 0  
 Fax: +49 202 6099 - 241

LC-1066  
 Rev. 01/2017  
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