



3M™ Liqui-Cel™ Membrane Contactor Degassing System Installed to Increase Well Pumping Efficiency in Rockland County, New York

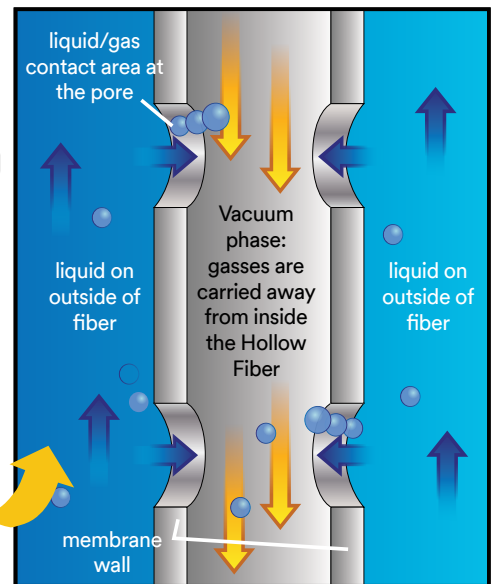
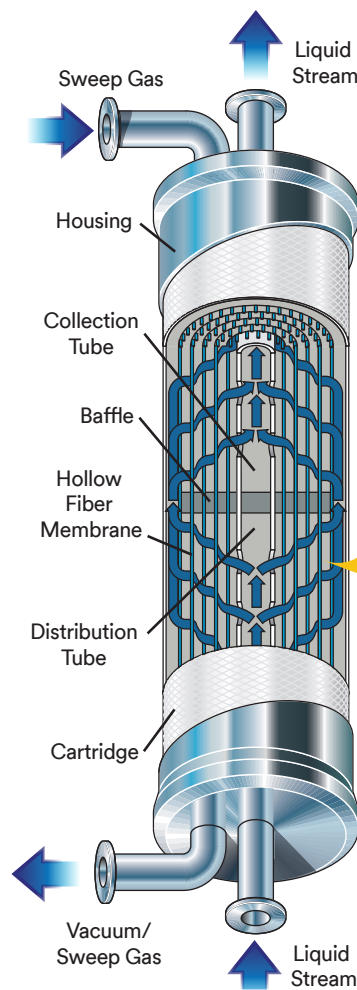
3M™ Liqui-Cel™ Membrane Contactors have a long history of improving water treatment systems by adding and/or removing dissolved gases. This technology was recently selected by United Water New York (UWNY) to improve water distribution efficiency while reducing capital and operating costs.

Liqui-Cel Membrane Contactors

UWNY operates the water supply and distribution systems throughout most of Rockland County, which lies just north of New York City. Of the forty-five wells in the water supply system, two contained high levels of entrained/dissolved gas, forcing them to operate below their optimal flow rates. Customers also complained about the cloudiness of the water, and the dissolved air accelerated corrosion and reduced carrying capacity in main lines, particularly those made of unlined cast-iron pipes.

Evaluating Technologies

During the research phase, UWNY evaluated alternative degassing technologies. A Liqui-Cel membrane contactor system was in use for gas transfer at a beverage plant nearby. UWNY was intrigued with Liqui-Cel membrane contactor technology and its potential to reduce operating and capital costs in their well pumping systems. They chose to run a pilot test on a well supersaturated with air that already had an existing stilling basin with booster pumps.



Cutaway of a Hollow Fiber Membrane
Gas removal occurs at the membrane pore



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3M™ Liqui-Cel™ Membrane Contactors contain microporous, hollow fiber membranes that allow the removal of dissolved gases from liquids. In the contactor, gas flows across one side of the membrane with liquid on the other side. Because the membrane is hydrophobic and microporous, only gases can pass through the membrane pores.

Lowering the partial pressure of the gas in the contactor allows the dissolved gases in the liquid to more easily transfer through pores in the wall of the hollow fiber membranes.

When the pilot test was complete, it was apparent that the Liqui-Cel membrane contactor system was the superior choice due to the reduced operating costs and lower capital requirements. In addition, membrane contactors removed the dissolved gases that caused the water cloudiness. Additionally, gas removal helps to prevent corrosion of the piping.

Exemplary 3M™ Liqui-Cel™ Membrane Contactor System Configuration and Operating Conditions

- 90 m³/h water flow
- Ten 10×28-inch contactors used in parallel
- X-40 membrane
- Operating mode: vacuum only

Benefits of Using the 3M™ Liqui-Cel™ Membrane Contactor System

- Water can be pumped from the well, directly through the membranes, and into the distribution system without breaking head. This eliminates the need for a separate basin or clearwell and repumping of the water.
- The overall headloss through the membranes is less than 5 psi, so existing well pumps can be used without a significant reduction in pumping rate. New well pumps can be installed to maintain the design pumping rate.
- The elimination of a stilling basin reduces the risk of contamination by any impurities that enter the basin.
- The footprint required for the Liqui-Cel membrane contactor system is about half the size required for a stilling basin alternative. Also, the building to house the membrane contactor system requires only a concrete slab on grade without any underground basin
- The smaller footprint and above-ground construction helps to streamline the permit process and construction schedule, shortening implementation time.
- The Liqui-Cel membrane contactor system is modular and can easily be expanded.



A building erected around the Liqui-Cel membrane contactor system. This installation is in a residential area, so it was important to conceal equipment in an aesthetically pleasing manner.

Results Before and After Installation for Wells 18 and 24

After the pilot test, UWNY installed Liqui-Cel membrane contactor systems at two of its wells. As Table 1 shows, the systems proved to be efficient and cost-effective. The application of this technology allowed these wells to operate at their design and permitted capacities, thereby providing higher peak capacity for the UWNY system.

For more information and system sizing, please contact your 3M representative or visit 3M.com/Liqui-Cel.

Table 1: Results Before and After Installation for Wells 18 and 24

	Before	With 3M™ Liqui-Cel™ Installed	Improvement
Maximum Capacity	1030 gpm*	1700 gpm	670 gpm
Typical Operating Capacity	1030 gpm*	1300 gpm	270 gpm
Entrained/Dissolved Air	Cloudy appearance	Clear appearance	Complaints eliminated, pumping capacity greatly improved

* Three-day peak operation in 2001. Liqui-Cel membrane contactor system results may differ based on the particular installation.

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**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
Fax: +49 202 6099 - 241

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