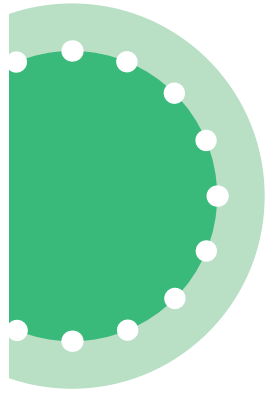


By Clare Pierson



# Stretching the Life of membranes

*When membrane installations were becoming commonplace in the 1990s, the technology was foreign and expensive to municipalities and utilities in the U.S. Since then, however, the technology has grown immensely more cost-competitive with conventional treatment, and plant operators and managers are more knowledgeable and experienced in the proper operation of membranes.*



Membrane technology compared to other treatment technologies, however, is unique because the membranes sacrifice their life and quality while treating water at the same consistently high levels. Therefore, membrane replacement and the costs associated with it are a common reality when using membrane technology.

A concern for municipalities is how long their systems will last and how much it will cost to replace the necessary equipment. Membrane replacement contributes the majority of operation and maintenance (O&M) costs for membrane systems. Over a 20-year project life cycle, equipment costs will constitute the main cost for membrane systems. Treatment equipment (not including the actual membranes) usually accounts for half of the life-cycle cost. Initial membrane purchase and membrane replacement combined typically account for about one-third of life-cycle cost. Energy and chemical costs usually account for around 10% of membrane life-cycle costs.

The American Membrane Technology Association (AMTA) projects that a well-designed reverse osmosis (RO) or nanofiltration (NF) system can last five to 10 years with proper handling and care; a microfiltration (MF)/ultrafiltration (UF) system's life expectancy is seven to 10 years.

## Best practices in caring for your membrane filtration system

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Expansion of their existing plant was estimated at \$3 to \$4.5 million, but McNeill was able to meet the need for only \$1.8 million, using its patented HEXA-DITCH design. The district saved 30% to 40% on construction, 70% to 90% on process piping and up to 70% on ongoing energy costs. High performance and lower costs – another McNeill success story.

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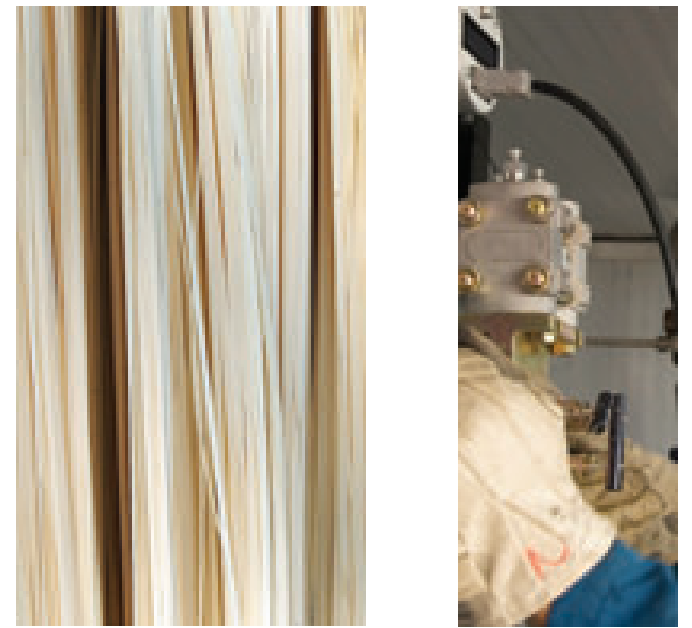
### Prevention & Pretreatment

The AMTA makes many recommendations to plant operators who use membranes on how to keep membranes running smoothly and as long as possible. Users of membranes—especially RO/NF technology—need to be aware that RO/NF is great for desalination and ion removal but can run into trouble when used to treat water with greater turbidity, particulate matter and solids.

A utility should strongly assess its source water supply on site before deciding on the particular membrane system. Measuring parameters such as microbial activity, total organic carbon, total suspended solids, temperature and pH—not just snapshots, but historical data as well—is critical in understanding incoming water quality.

Conductivity measurement is a critical parameter in an RO system. Conductivity measurements provide an indication of system efficiency and can be used to trigger an alarm condition when product quality or percent rejection decreases indicate a problem. A number of conductivity controllers specifically target the RO industry.

Pretreatment is usually needed for turbidity reduction, iron or manganese removal, stabilization of the water to prevent scale formation, microbial control, chlorine removal (for certain membrane types) and pH adjustment. This will reduce and prevent fouling of the membrane.



An effective example is gravity filter pretreatment, which helps eliminate membrane fouling by removing biological solids and turbidity, which in turn reduces physical deposits and trapped particles. It can consistently remove solids so the membranes can perform efficiently. The filter media will remove particulate material prior to the effluent being fed to the RO membrane system.

Prior to initiating the design of an MF or UF treatment facility, a pilot plant study would most likely be necessary to determine the best

## Membranes in the Berkshires

Vacation Village Resorts in Hancock, Mass., offers 364 fully furnished suites decorated in a traditional New England style, with fireplaces, furnished balconies with mountain views, pools, Jacuzzi, fitness room, arcade, Internet room and many other amenities.

It can now add to its list of amenities a state-of-the-art membrane



bioreactor (MBR) wastewater treatment plant, which will be supplied by Koch Membrane Systems, Inc. The installation will be the first to use PURON modules in a private facility.

Vacation Village selected PURON PSH 500 membrane modules to be retrofitted into an existing bio-

logical wastewater treatment system. The entire plant will be installed with most of the equipment located underground to preserve the aesthetic characteristics of the environment at the Berkshires-based resort, while still providing premium wastewater treatment.

The membrane modules that will be used take up less space than conventional treatment alternatives. A key advantage of the module is the use of a single header with reinforced hollow fibers that are fixed only at the bottom. The sealed upper end of each fiber is allowed to float freely. This eliminates the collection of hair and other materials that can clog the upper end of membrane fibers in MBR module designs that employ both a top and bottom header.

Biomass and particulates, including bacteria, are retained by the membrane and remain in the filtration tanks, while permeate is extracted through the membrane to the inside of the fibers for discharge. The outside-to-inside flow configuration provides optimal solids management and a high permeate output rate and uses up to 50% less energy than other MBR systems thanks to the unique aeration system design.

"The project not only allows the resort to expand," said Michael Chan, project manager at Koch Membrane Systems, "but the plant upgrade will also produce high-quality effluent that will meet the current subsurface discharge standards and help Vacation Village to anticipate future regulatory requirements." WWD

APPLICATION



membrane to use, particulate/organism removal efficiencies, cold and warm water flux, the need for pretreatment and fouling potential. The results of a pilot study will help plant officials and operators better understand the membrane system's life cycle and potential future costs.

It is recommended that utilities and municipalities who are opting to install a membrane treatment system closely examine warranties from the manufacturer. They may also want to inquire about the membrane's permeability. Membrane permeability is a membrane's ability to pass water relative to the applied pressure. When measured, it can indicate the membrane's fouling rate. Permeability can identify when problems such as tightening of the membrane, fouling, scaling or loss of flow are occurring.

#### Staff & Lab

Enough good cannot be said of having an attentive and educated staff to closely monitor a utility's system at all times, especially the pre- and post-treatment parts of membrane systems. These actions alert plant operators to impending problems so they can act quickly to prevent damage.

Early detection of changes in a utility's source water is also an important key to successful plant operation. Staff should have access to proper tools and equipment to fix problems and conduct tests and inspections.

#### Learning from Others

Fortunately, with the large influx of membrane installations that has occurred over the past 10 years in the U.S., there is a wealth of information, including case histories, workshops and technical experts, which can supply knowledge about the technology and solutions.

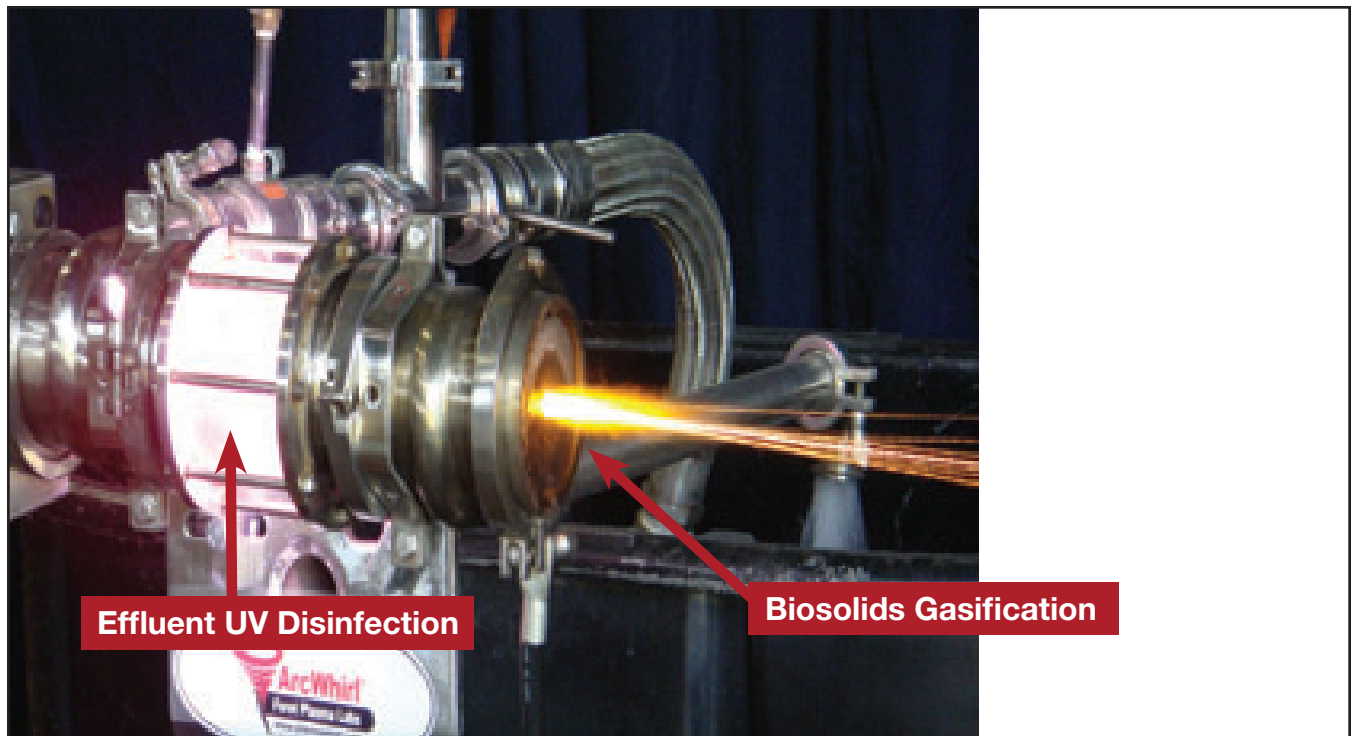
Finally, an always effective method of learning about pretreatment and methods of preventing fouling and scaling is through training seminars and workshops that are held across the country each year. **WWD**

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For a demonstration, please visit our website at [www.plasmawhirl.com](http://www.plasmawhirl.com).

#### Specifications

Size	Electrical Power	Max. Flowrate	Solids Feedrate
4"	35 KW	72,000 GPD	700 lbs/hour
8"	100 KW	1 MGD	1 ton/hour
72"	1 MW	10 MGD	10 tons/hour



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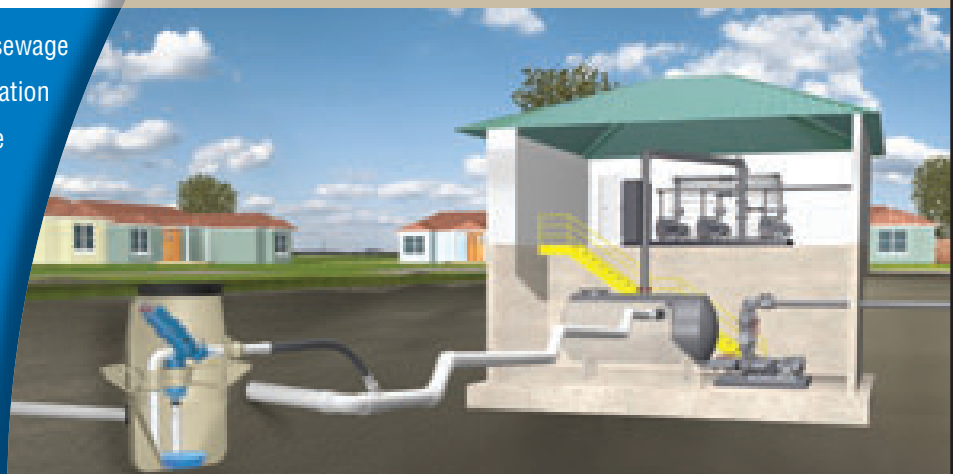


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