Ben's Design Tip Corner

By: Ben Movahed, PE, BCEE

If you have a tip or a suggestion for a future design article, please contact Ben Movahed.
(240) 780-7676
movahed@watek.com

Membrane Systems Need Care and Attention

Membrane systems are not designed to "install-and-forget". These systems represent a significant investment that warrants consistent, specialized care, monitoring, and regular maintenance. The primary goals in system operation should be to predict and prevent irreversible membrane damage, which can trigger performance degradation, reduce efficiencies, decrease membrane life span, drain budgets, and jeopardize the product water quality.

Much like arterial plaque, which can reduce blood flow or, in some instances, block it altogether, insoluble compounds and foulants present in system feedwaters can build up on the membrane surface, obstructing water flow and reducing the efficiency of this precise and highly dependable purification process.

Even with the optimum pretreatment and chemistry controls in place, membrane facilities should develop a comprehensive monitoring and maintenance program that protects their membranes and ultimately their customers' water quality.

The Seven important elements of successful care and operation of membrane systems are:

1. **Staff Training and Support:** It is important to note that even the best designed and built facility will fail if the persons responsible for operating and maintaining the plant do not receive the training and support tools needed. Invest in your operators and give them the proper knowledge and tools they need.
2. **System Monitoring:** Membrane water treatment facilities can operate in a steady state condition if the input parameters such as raw water quality remain constant and the plant is operated within the optimum conditions and maintained properly. This is one of the reasons why system monitoring technology has been so widely accepted, and many facilities are routinely operated with only minimal human oversight. The key is to know and compare the vital operating parameters, such as flux, recovery, pressures and flows, throughout the system and to detect early signs of problems.
3. **Water Quality Monitoring:** Unlike other treatment technologies, which produce lower quality product as the raw water quality degrades, membrane systems produce consistent water quality while sacrificing themselves. Therefore, early detection of raw water changes and appropriate adjustments to the operational parameters to accommodate these changes are the keys to successful plant operation.
4. **Performance Tracking:** Membrane system operational parameters can be very complex and relying on visual observations and daily data collection is typically not adequate to see the subtle changes in performance. This is the reason why continuous on line analyzers and instruments are used in membrane plants. The output of such tools should be graphed and monitored continuously, along with normalized data to keep track of the performance, identify performance issues early, and predict potential problems.
5. **Maintenance Program:** Just like pumps and motors which require routine maintenance, membrane systems also require routine inspection and care. Most membrane systems rely on instruments and analyzers for controls. All such devices need to be routinely calibrated and checked. The PLC controller does not know the difference between good and bad data and will simply react according to the programmed parameters. Membranes rely on proper chemistry and chemical dosages and dosing pumps need to be routinely checked and calibrated for optimum results.
6. **Membrane Cleaning:** Every membrane system requires a unique cleaning regime and recipe due to water quality, system operating parameters and site specifics. Operators should follow the recommended frequency and procedures for cleaning. Excessive buildup of foulants on the surface of membranes may be difficult to remove and can reduce the chance of recovering baseline membrane performance.
7. **Budgeting and Planning:** Being proactive with planning and budgeting helps you protect the system and reduce your operating headaches. Plan, budget and give cost requirements to the purchasing and decision makers. Consider all costs including labor, consumables, membrane replacements, cleaning chemicals, process chemicals, parts, etc. in your budget. Unfortunately, I see too many facilities that are forced to cut their system maintenance budget causing operators to get "creative", purchase low cost products and "cheap" chemicals, and try to take "shortcuts". Remember, "shortcuts" do not exist in membrane facilities. They will come back and haunt you! ■