Contributed By PCI Membrane Systems, Inc.

ETV Testing Verifies

Membrane Filtration Plant

Treats Surface Water, Meets D/DBP Rule

The U.S. Environmental Protection Agency (EPA) verified that the Fyne Process water treatment system from PCI Membrane Systems, Inc. in Milford, Ohio, is able to meet stringent EPA disinfection byproduct (DBP) standards. A study published as part of the EPA's Environmental Technology Verification (ETV) Program verifies the performance of a Fyne Process membrane filtration plant tested on high organic-laden surface water in Barrow, Ark. The plant was able to remove significant levels of organics—precursors to disinfection byproducts such as trihalomethanes (THM) and haloacetic acids (HAA)—producing water that easily met the disinfection byproduct standards set by the EPA's stringent Stage 1 D/DBP Rule.

Barrow's untreated water had an average total organic carbon (TOC) level of 15 mg/L and with moderate turbidity. Over the 57-day test period, the average TTHM concentration was reduced from 535 µg/L in chlorinated raw water to just 31 µg/L in water chlorinated after nanofiltration in the Fyne Process test plant. Average HAA(5) concentrations were reduced from 398.4 µg/L to just 6.2 µg/L. The membrane system also reduced UV254 absorbance, total organic carbon and turbidity—measures of water color and clarity—by 97.5 percent, 95.4 percent and 98.3 percent, respectively.

The ETV program was implemented to assist in the development of innovative, cost-effective environmental technologies including packaged drinking water treatment systems. This chemical-free nanofiltration membrane process was specifically designed to meet the needs of small communities. The technology already is used extensively in Great Britain and, more recently, in North America.

DBP concentration is an issue in cities such as Barrow, which depend on surface water for drinking. In Alaska, the northeast United States and along the rocky Canadian Shield, it is difficult to drill wells. Smaller communities in these areas often rely on surface water that tends to be heavy with dissolved organic materials. Heavy chlorination is required and that can lead to high TTHM and HAA(5) concentrations in the treated water. Studies have shown that TTHMs and HAA(5)s may be carcinogenic and have linked them to miscarriages.

Until promulgation of the Stage 1 D/DBP Rule, small surface-water systems in the United States have been exempt from federal EPA limits on TTHMs and HAA(5)s in their treated water. Compliance now is required by November 2003. By meeting the rule's specifications, companies can be well-positioned to help affected communities get ready for the more stringent regulations.

The testing was performed by the University of Alaska, in cooperation with the University of New Hampshire, which is a qualified field testing organization under the ETV program.

For treating small surface-water flows (more than 1,000 gal/day), the easy-to-clean tubular membranes of the Fyne process may be a better choice for small communities among higher-maintenance spiral membrane systems, says David Pearson, general manager at PCI North American. "Using tubular nanofiltration membranes, the Fyne process can be run with minimal operator intervention and it requires little to no source-water pretreatment and extremely infrequent chemical cleaning.

"Spiral membranes require frequent chemical cleaning or expensive pretreatment on these organic waters, and then there is the issue of cleaning-chemical disposal," explains Pearson. "But the surface of the tubular membranes of the Fyne process can be kept clean with foam balls, so the system doesn't need any real maintenance for several months." This, automated, "foam ball" cleaning cycle periodically forces foams balls through the tubular membranes, loosening accumulated material and removing it from the system. PCI offers complete water-treatment packages, including containerized plants, and also can provide remote monitoring of system performance. WQP

Just the Facts

Location: Barrow, Arkansas.
Problem: High organic-laden surface water. Small community system test plant must meet EPA's disinfection byproduct rule. Total organic carbon level of 15 mg/L, trihalomathane levels of 535 µg/L and haloacetic acids levels at 398.4 µg/L.
Solution: Fyne Process Membrane Filtration System.
Results: Removal of significant levels of organics and meeting the Stage 1 D/DBP Rule. TTHM level reduced to 31 µg/L and haloacetic acids reduced to 6.2 µg/L. The system also reduced UV254 adsorbance by almost 98 percent, TOCs by more than 95 percent and turbidity levels by more than 98 percent.

This Fyne Process membrane filtration system at Chapel Island First Nation in Nova Scotia was the first such system installed in North America. It has been processing organic-laden surface water in the small rural community since February 2000. A study published as part of the EPA's Environmental Technology Verification (ETV) Program verifies the performance of another Fyne process membrane filtration plant tested on high organic laden surface water in Barrow, Arkansas.

About the Contributor
PCI Membrane Systems offers complete water treatment packages including containerized plants, and also can provide remote monitoring of system performance. In addition to tubular membranes for liquids containing suspended or colloidal materials, PCI also supplies spiral-wound or hollow fiber membranes for clean solutions and ceramic membranes for high chemical compatibility and thermal resistance.

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