

High-Performing Membranes Provide Absolute Barrier to *Cryptosporidium* and *Giardia Lamblia*



The challenge

In 2008, Murfreesboro Water Resources Department in Tennessee sought to expand and update aging equipment at its Stones River Water Treatment Plant (SRWTP). Located just outside of Nashville, the city's population was rapidly growing, and the water treatment plant required additional capacity to meet demand. The upgrade also gave Murfreesboro the opportunity to proactively prepare for anticipated new EPA regulations relating to water treatment while preventing *cryptosporidium* and *giardia lamblia* from reaching the public water supply.

Natural conditions, turbidity, and water hardness in the Murfreesboro area posed additional treatment challenges for the SRWTP expansion project. The plant, which draws some of its source water from a river that has elevated levels of turbidity during rain events, previously saw finished water turbidity levels below 0.3 NTU during heavy rainstorms. The latest expansion included a comprehensive upgrade of the lime softening technology used to reduce the hardness, iron, and manganese from the raw water and provide pretreatment for the membrane filtration system.

The solution

When the plant update and expansion project was initially conceived, membranes were coming to the forefront as the most reliable, highest-quality filtration technology. This was appealing to the Murfreesboro Water Resources Department, as the city wanted to be on the cutting edge with a top-of-the-line water treatment plant and technology capable of meeting treatment requirements. Compared to sand filtration, which SRWTP previously used, membrane filtration allows the plant to more effectively control *cryptosporidium* and *giardia lamblia* at a lower cost and with an absolute barrier to the protozoans.



"The quality of [Aria Filtra's] membranes and the Aria FLEX system overall has been extremely impressive. In nearly 10 years of operation, we have had very little instances of breakage or repair compared to our peers that are using different membrane providers. Our membranes have just as much life in them today as they did on day one."

Alan Cranford, water treatment plant manager, Murfreesboro Water Resources Department

After evaluating numerous membrane filtration systems, the Aria FLEX™ low-pressure, hollow-fiber system from Aria Filtra® was ultimately selected due to its ability to meet high safety standards in regards to water quality and operator safety. In December 2008, Murfreesboro Water Resources Department commissioned SRWTP (20 million gallons per day [mgd]), enlarging and upgrading the facility to be the largest membrane filtration plant, the largest on-site sodium hypochlorite generation facility, and the only lime softening water treatment plant in Tennessee at the time. The plant, which was constructed in 1967 and averaged 10.6 mgd prior to expansion, is also one of the only facilities in the world that has the capability to utilize granular activated carbon either before or after membrane filtration to improve taste and remove odors.

The results

When the upgraded SRWTP opened its doors in 2008, it was operating at the highest flux rate in the country. Able to run at 87 gallons per square foot per day (gfd), Aria Filtra delivered considerably higher flux rates than any other solutions provider that Murfreesboro qualified, as none dared to commit to flux rate above 50 gfd. With this premium flux rate, Murfreesboro could optimize performance and achieve its desired water capacity using fewer membrane modules. This resulted in a significant savings during the upfront purchase and will translate through the lifetime of the system, as there are fewer membranes to replace. During construction, the coagulant pump failed, causing increased settled water turbidity to reach 78 NTU, instead of the 1 to 10 NTU normally seen by the plant. Even with turbidity this high, the robust nature of the membrane system was able to consistently

provide a higher quality of water at 0.02 to 0.04 NTU.

After more than a decade of operation, the Aria FLEX system is still running strong. With clean-in-place conducted monthly, the membranes are able to recover and perform at the same standards as when they were placed in service in 2008. Still on the cutting edge of water treatment technology, Aria Filtra's membranes allow SRWTP to remain compliant with ever-changing water quality regulations. SRWTP is joined by only a select few drinking water facilities in pioneering membrane filtration for the state of Tennessee. There are now approximately 50 membrane systems at drinking water facilities in the state. The success of Murfreesboro's SRWTP set the standard for membrane filtration in Tennessee, as several of the region's utilities look to Murfreesboro for guidance.

Initially intrigued by the opportunity to reduce membrane costs when it was time to evaluate replacement bids, SRWTP swapped out one train of Aria Filtra membranes with a competitor's membranes, as the company was willing to match Aria Filtra's warranty. Fifteen of 46 modules of the competitor could not pass an integrity test on startup and could not be repaired. These 15 modules were replaced 30 days into the trial. The replacement membranes in service were comparable to Aria Filtra's operationally, though a mere seven months into the testing phase the membranes experienced significant drops in permeability and flux rates fell within hours of cleaning. The continued decline of the competitor's membranes led to the Murfreesboro Water Resources Department removing the rack of replacement modules and reinstalling the proven, hollow-fiber membranes from Aria Filtra.



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