# RAPID VALLEY SANITARY DISTRICT

CASE STUDY

UF/NF

High-quality drinking water produced despite long spans of below zero temperatures.

**APPLICATION:** Municipal Drinking Water

**CAPACITY:** 3 MGD

**LOCATION:** North Dakota, USA

**COMMISSIONNING:** Spring 2020

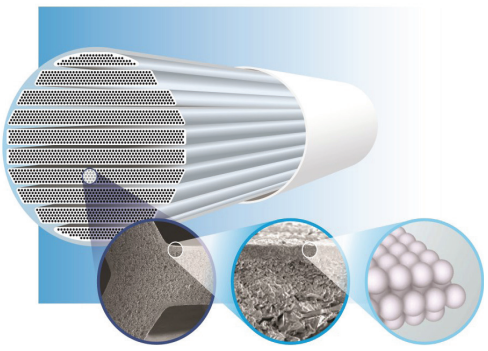
**TECHNOLOGY:** Ultrafiltration

***98%***

***Overall factory water recovery rate***

***70%***

***Reduction in chemical cost***



Feed channels are designed to maximize membrane surface area, while not compromising on flowrate. The unique surface coating and overall microstructure provide consistent, reliable removal of solids down to 30 nm in size.

## CHALLENGE

The Rapid Valley Sanitary District needed to consistently meet the demand for 3 MGD of high-quality drinking water to the community of Rapid Valley, South Dakota – even during long spans of near-freezing temperatures

- Not meeting capacity demands: Near-freezing temperatures, varied quality of feed water, combined with excessive need for maintenance and cleaning of polymeric micro filtration membrane (MF) systems significantly challenged the Rapid Valley community with supplying sufficient potable water to meet current and future demands
- Significant operator intervention needed to avoid system shutdown: Existing polymeric membranes regularly experienced irreversible fouling and fiber breakage compromising the normal runtime and required regular maintenance to address these on-going issues
- Lost productivity and increase operating expenses: The manpower and chemical costs to maintain the aging system had a significant impact on operating costs

BACKGROUND

## SOLUTION

Implementation of two Nanostone CM-151 Ceramic Ultrafiltration Membrane Systems enabled Rapid Valley to:

- Restore the required capacity to 3 MGD using only two systems out of three, providing a reliable supply of high-quality drinking water to the community even during near-freezing temperatures, or with the massive fluctuation of feed water quality, and increased the water recovery rate of the overall plant from 95% to over 98%
- Operate trouble-free and consistently pass daily integrity testing, meeting rigorous quality standards for drinking water
- Decrease chemical consumption by 70% by significantly extending the time between chemical cleanings
- Drastically reduce process steps with high manpower demands, with fewer shutdowns to pin broken fibers

# RAPID VALLEY SANITARY DISTRICT

## BACKGROUND

In 2017, the Rapid Valley Sanitary District was not able to reach its goal to deliver three million gallons per day (3 MGD) of drinking water to the community. The root cause was the unreliable and insu cient capacity from the existing polymeric microfiltration systems, which included a system for treatment of backwash from the three other skids. Above and beyond the capacity challenge in the winter, where near-freezing feedwater caused shrinkage in the polymeric membranes, the systems were subject to frequent fiber breakage and irreversible fouling. This problem was particularly exacerbated when the plant experienced turbidity spikes on incoming water quality as high as 15 NTU.

Additionally, the constant fiber breakage issue required manual maintenance, creating an untenable situation for the operators. With the number of shutdowns for cleaning and maintenance, in addition to erratic feed water quality fluctuations, increasing along with the corresponding costs of chemicals and labor, the Rapid Valley Sanitary District knew they needed to replace rather than repair – but they didn't want to replace PUF systems only to have the same problem in the future.

After a system audit revealed an opportunity for Nanostone to help improve performance and reliability, the district installed its first set of Nanostone CM-151™ ceramic ultrafiltration membrane modules to replace the difficult-to-treat backwash recovery unit. The unique design of the CM-151 ceramic membrane necessitated fewer chemical cleanings, saving the plant 70% on chemical costs, and at the same time, increased the backwash system recovery rate from 80% to 92%, reducing operational headaches and many hours of labor.

Seeing the success of the backwash recovery system, the district retrofitted two out of the three racks of the main processing system with Nanostone CM-151 modules. The unique, patented monolith design of the CM-151 tolerated higher incoming water variability, helping restore Rapid Valley's output to 3 MGD with only two systems running, as well as enable the plant to consistently and reliably pass its daily integrity test. The systems have also been able to handle feed water turbidity spikes. With the significant increase of the recovery rate of the backwash system, the recovery rate of the overall plant increased from 95% to over 98%.

Since investing in Nanostone's CM-151™ ceramic UF system, the Rapid Valley operators have a stable, long-term solution for clean water and consistent volume. When the third rack is changed out, the overall capacity will be expanded to 5 MGD with the same footprint, enabling the community to have a resilient water system for current and future capacity needs.

***The unique patented monolith design of the Nanostone CM-151™ tolerates near-freezing temperatures, while the ceramic matrix means fiber breakage is no longer an issue.***