

Case Study

City of Waupun Water Treatment System



Project Details

Location: Waupun, Wisconsin

Application: Water Softening

Capacity: 1.1 million GPD
2.9 million GPD peak flow

Engineering: Waupun Utilities

Commissioned: 2007

Overview

When the city of Waupun began to experience water quality issues, Waupun Utilities sought new technology to replace the city's aging water softening facility. "The water softening facility was quite outdated and had reached the end of its useful life," noted Steve Schramm, treatment facilities supervisor for Waupun Utilities. "In addition, we had no equipment redundancy, causing repair and reliability issues."

Waupun's raw water is relatively hard due to the presence of dissolved calcium and magnesium. In addition to providing poor soap lathering, leaving a salty residue in hair after shampooing, and coating tea and coffee pots, hard water can have a significant adverse effect on community infrastructure. For example, hard water causes scaling that can clog pipes and decrease the lifespan of water heaters and toilet flushing units. Water hardness can also have a negative effect on industry, causing boiler breakdowns and problems with cooling towers or other equipment that comes in contact with water.

The Challenge

To find a flexible, reliable, and cost-effective water softening technology to improve Waupun's water quality.

The Solution

After researching several alternatives for the central water softening facility, Waupun selected a Koch Membrane Systems (KMS) reverse osmosis (RO) water treatment system. The pre-engineered, packaged RO system uses 18-inch diameter MegaMagnum® membrane elements. A single MegaMagnum spiral element contains 2,800 square feet of membrane surface area, compared to 400 square feet in commonly-used 8 inch RO membranes.

One of the key features that drew Schramm to the KMS RO system was its expandability. "If a major water customer moves into the city or if the city grows rapidly, we can just plug in another RO skid, rather than add on to a building or build extra tanks," says Schramm. "The reduced capital and operating costs, plus the ability to expand the system easily, sealed the deal for us."

Using the 18-inch membrane elements allowed the city to construct a smaller building, which cost approximately \$1 million dollars less than the capital costs for a replacement lime softening system. Plus, the Mega-Magnum® RO system requires only one operator, roughly two hours per day, seven days per week, reducing annual operating costs considerably. The new water softening process is working well, reports Schramm, with a noticeable improvement in water consistency.

The Treatment Plant

The new water treatment system at Waupun consists of pretreatment, reverse osmosis, and post treatment (See Figure 1). When raw water from Waupun’s five wells reaches the plant, booster pumps increase the raw-water pressure to provide the proper operating pressure for the pretreatment system. Pretreatment is provided by disposable cartridge filters and multi-cell greensand filter media to remove iron and manganese. Pretreatment prolongs RO membrane life and helps meet recommended standards for iron and manganese removal in drinking water.

After water passes through the filters, it then moves to the RO system.

Waupun’s system consists of two pre-engineered packaged skids, called “trains” which operate on alternate

days. The dual-skid configuration provides system redundancy, facilitating maintenance. If for any reason increased capacity is needed due to fire-protection needs or another large water demand, the city could run both trains at the same time to increase capacity. (See Table 2 for additional details on system capacity.)

“There is not a lot of maintenance on the RO system,” says Schramm. “We change the cartridge filters about once every three months, and conduct clean-in-place (CIP) of the membranes about once every six months. RO membrane elements are projected to last three to five years, but we’ve talked to other operators of RO systems that have seen elements last as long as seven or eight years, depending upon the level of pretreatment and how well the CIP operations are conducted.”

A final benefit is a measure of security in the face of potential changes

to water quality regulatory requirements. “We meet and exceed all our state regulatory requirements and are confident that this system will allow us to meet any changes that make water quality requirements more stringent in future” notes Schramm.

Product Overview

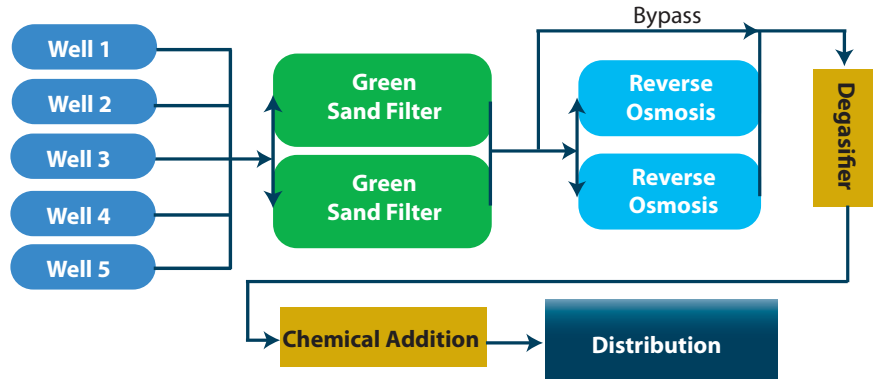
KMS offers a wide range of RO elements in the spiral wound configuration suitable for a variety of separation requirements.

KMS offers both packaged and custom RO systems. KMS’ pre-engineered, packaged water treatment systems using RO technology offer optimum water treatment within a compact, skid-mounted package. For larger systems, KMS engineers can design and build a custom system to meet your specific needs.

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Figure 1



Flow per Train	Well Pumpage (Gallons per minute (gpm))	RO Feed (gpm)	Permeate (gpm)	Concentrate (gpm)	Bypass (gpm)	Finished water to distribution (gpm)
1	1,122	922	738	184	200	938
2	1,122	922	738	184	200	938
Total	2,244	1,844	1,476	368	400	1,876