

The City of Everest Takes the Necessary Steps in Nitrate Removal



These new high service pumps were equipped with variable frequency drives to help control the plant and also eliminate water surges on the system.

The city of Everest is a small town located in southeastern Brown County, KS. Everest has a population of 400 people, being served through 165 water service meters.

For years the city has had increasing levels of nitrates in its two wells. The wells are located 2.5 miles south of town, near the Atchison County Lake. Currently the level of nitrate in the raw water is at 12 milligrams per liter (mg/L) or parts per million. The maximum contaminate level for nitrate in drinking water is 10 mg/L.

Because of the nitrate content and the requirement to send notices to the public about the water quality concern, the city decided to apply for a loan and a grant to build a reverse osmosis plant. USDA Rural Department provided \$705,800 to the project in the form of a loan. The Kansas Department of Commerce also awarded a \$400,000 Community Development Block Grant for the project. The total project cost was \$1,105,800. B.G. Consultants of Lawrence, KS was the project consultant.

The first step in the project was to construct a new treatment building. It is located at the west edge of the town. The general contractor on the job was Bottorff Construction of Lancaster, KS. The building is not only to house the new RO plant, but also includes a new 72,500-gallon clearwell. The clearwell also has a baffle to increase detention time.

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Another part of the project was to add variable frequency drives (VFD's) at the two wells. These are essential to provide the proper amount of gallons per minute to the plant. The VFDs are also beneficial to reducing stress on the

pipelines as surges are eliminated. VFD's were also installed on the high service pumps on the clearwell and on the booster pumps on the RO plant itself. All seven VFD's have built-in inverters to convert single phase to three-phase. The cost to supply three-phase power from a utility company was going to cost the city about \$125,000, so it was much less expensive to purchase the VFD's with inverters.

After touring several other RO plants in northeast Kansas, the city council made the decision to go with the Harn R/O system. Mark Lamme, Operator for the city of Everest, commented that a major factor in purchasing a Harn system was that it came with a lifetime 24/7 technical support clause. "The plant can be connected to a phone line, in case of a malfunction, and a support tech can attend to and modify the operation to correct the situation via the phone," Lamme says. In order to maintain warranty on the plant, Harn requires a 28-column data sheet to be completed daily.



Inside the new Harn R/O plant in Everest, KS.

The plant was manufactured by Harn R/O Systems, Inc. of Venice, FL. The plant is capable of producing 108,000 gallons per day per skid. The city purchased two skids to produce an adequate water supply. Each skid has three membrane vessels that hold six membrane filters. Currently, the city only uses five membrane filters and a false membrane filter; a sixth filter can be installed to increase water production. All the framework on the skids is made of fiberglass. This was another major factor in the decision to go with a Harn system; there will be no corrosion problems caused by chlorine.

Since coming online in December 2011, the plant has been operated at 82 gallons per minute. Of the 82 gpm, 52 gpm is being filtered through the plant,

with 17 gpm being blended with the finished water, and 13 gpm going to waste. At this rate of operation, with the raw water nitrate coming in at 12 mg/L results in a finished water with a nitrate level of 5.6 mg/L.

The Harn system also came with a membrane wash system. This is a heated system that uses a chemical solution to properly clean the filters. With Everest having a low silt density index, it is estimated that the membranes will only have to be washed every three years.

The project funding also allowed for the cleaning, sandblasting, and painting of the city's elevated water storage tank. Several modifications had to be made to have the tank meet OSHA standards. The entrance at the base of

the tower had to be increased in size to allow an operator to fit through an inspection panel. Another was the vent on top of the tower had to be replaced. This was because the ladder on the tank was on top of the vent. All modifications and maintenance were made by Cunningham Sandblasting and Painting of Joplin, MO.

Water rates at Everest were increased to amortize the additional debt and pay for operation of the plant. The monthly minimum was increased from \$12 with 1,500 gallons of water allowed to \$20.50 with 1,500 gallons of water allowed. For usage over 1,500 gallons, the rate was increased from \$3.80 per thousand to \$6.40 thousand. A new residential/business category was also established with the base rate being \$31 monthly. The city has a declining rate; water in excess of 41,000 gallons per month previously cost \$1.02 per thousand; that rate is now \$1.16.

See vendors at annual conference

In the past several years since I have been employed by KRWA, I have found that the annual KRWA conference is one of the best places for cities and rural water districts to shop for products and services for their utilities. This year's conference has 304 exhibit spaces. The KRWA Web site allows users to see the names of companies; booth numbers are already assigned. Check out the EXPO Hall Floor Plan on the "conference link" at www.krwa.net. Just "mouse-over" the booth numbers on the floor plan and the names of exhibitors will pop up. It's cool!

Tony Kimmi has worked as a Tech Assistance for KRWA since October 2009. He has extensive experience in the operation of construction equipment. He has assisted in the construction of several rechlorination stations and ongoing monitoring of water quality issues. Tony enjoys providing assistance to public water systems.



End view of the two-skid R/O plant now producing water for Everest, KS.