



## **Pottawatomie Rural Water District No. 4 Makes Much-needed Improvements**

This photo shows the two ground level storage tanks (clearwells), each with a capacity of 15,000 gallons. The tank on the right was constructed as a part of this project.

**R**ural Water District No. 4, Pottawatomie County RWD 4 is a relatively new water system and has just completed extensive improvements to help produce better quality water.

Pottawatomie County is located in northeastern Kansas; it is one of the larger counties in the state covering 551,692 acres or 862 square miles. The northern portion of the county is largely agricultural while many southern areas consist of existing and planned developments, especially in the area along Highway 24 between Manhattan and Wamego.

Pottawatomie RWD 4 began operations in 2001, serving the southeast part of the county. This part of the county was the last to be supplied with rural water as nearly all other areas of this large county are supplied by other rural water districts.

Pottawatomie RWD 4 presently serves about 500 connections with about 240 miles of pipeline. Included as RWD customers are the cities of Westmoreland and Delia. Another large customer is the Jeffrey Energy Center, a large power generating plant.

The water source for this system is two wells, located to the northwest of the city of Belpre. These wells produce a very adequate quantity of water but preliminary testing indicated high total hardness with some iron and manganese. As a result, water treatment facilities consisting of reverse osmosis (RO) was installed to reduce the level of

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total hardness and pre-filters were installed to remove iron and manganese thereby protecting the RO membranes.

### **Filter costs make an impact**

One of the reasons, if not the primary reason, the district felt changes were needed at the plant is that the average length of time in use for these pre-filters is between four to seven days. These are Hydrex filters that do a good job

protecting the RO membranes but due to the cost of the filters and the short runtime, the cost at \$12 per filter really added up.

There are two RO skids, each with six vessels. Each skid has two Hydrex filter tanks and each tank contains seven filter cartridges. Therefore, the cost at each filter change interval (at four to seven days) is \$336. The yearly cost for this procedure alone varies from \$17,720 to \$30,660, depending on the runtime between filter change intervals. Another ongoing cost that this system was saddled with was with the filters on the raw water bypass line. Like most systems that treat with RO, only the amount of water needed to reach the desired finished water quality is treated by the RO membranes. Dan Hoobler, RWD operator, noted that at this time, the raw water flow from the wells is 375 gpm. Of this amount, 250 gpm flows through the RO membranes, 50 gpm flows to waste, and 75 gpm is the flow in the blend

(raw water bypass) line. In order to eliminate or at least minimize iron precipitates from entering the distribution system from the blend line, bag filters were installed in this line. There are two bag filter tanks, each containing one bag filter. The average run time for these bag filters is 2 to 4 days and each costs \$5; or \$10 for each bag filter change interval. The expense related to filter changes, especially the Hydrex filters, caused the district's board of directors to look in other directions. The subject of adding pressure sand filters ahead of the membranes was discussed but considered too costly without financial assistance.

With pressure sand filters not considered as being feasible, the district's board considered another alternative consisting of possibly treating the wells. Water Systems Engineering, Inc. was contacted to perform various analyses to determine what contaminants were actually flowing into the plant. Testing was done on both the well water and the filter scrapings. While the results of these tests did indicate some iron, the results showed the level of particulate matter (clay) was high. As a result, a well treatment procedure was prepared and Layne-Western was selected to perform the work. This procedure proposed by Layne-Western consisted of three steps that included chemical treatment to attack iron bacteria within the wells, redevelopment treatment to soften clays to allow for removal, and chlorination treatment. This procedure was completed in 2006. According to a former RWD operator on board at the time that this treatment took place, the well treatment procedure was effective and the



Dan Hoobler, operator, is removing a bag from the canister. Note the brown stain on the filter indicating iron was removed from the raw water bypass (blend) line. Without the bag filter, the iron would have been allowed to enter the storage tanks and possibly the distribution system causing customer complaints. The bag filters will no longer be needed with the use of the pressure filter.

received \$1.132 million to make improvements to the plant and replace some water lines. These improvements include expansion of the building, installation of a pressure sand filter, installation of a filter backwash water storage tank, and the addition of a second ground level clearwell. Included also were seven miles of pipeline to improve the distribution system in the area of the former Jackson RWD No. 2 which has been assumed into Pottawatomie RWD 4. Jackson RWD 2 was a small water system located just adjacent to Pottawatomie RWD 4 in the extreme southwest corner of Jackson County. The water system formerly serving Jackson

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water quality was much improved but only for a short time. As a result, the district was back to square one.

As noted earlier, the district needed financial assistance to proceed with necessary improvements to solve the problem with very short cartridge filter run times. This was accomplished with funds through the USDA Rural Development-American Recovery and Reinvestment Act (ARRA). The district



This is the two-cell pressure sand filter that was installed to remove oxidized iron and clay particles before reaching the Hydrex cartridges and RO membranes. This unit is the main focus of this improvement project.



This is an end view of the two RO skids. The RO membranes were recently replaced after about 9 years of use at a cost of \$72,000.



This photo shows the center of the bag filter with iron accumulation.

RWD 2 dated back to the 1960s when the area was a part of the 548th Strategic Missile Squadron based at Forbes Air Force Base in Topeka. This site, along with eight other Atlas E complexes, basically formed a ring around Topeka and was in operation from 1961 to 1965.

Dan Hoobler stated that frequent water leaks in this area necessitated making improvements to the distribution system.

With the new two-cell pressure filter system in place, all raw well water will flow through the sand filter, then through the plant. Pressure supplied by the well pumps to the sand filter will be about 100 psi. Each RO skid is equipped with a pressure booster pump to supply from 200 to 220 psi to the membranes. The raw water blending ratio will be about the same as it is now. However, once the sand filter is brought on-line, the bag filters will no longer be needed and the current 5 micron Hydrex cartridges will be replaced with 1 micron cartridges. This change should provide even greater protection for the RO membranes, which were recently changed out at a cost of \$72,000 after nine years of use. When asked if these improvements resulted in an increase in water rates to customers, Dan

Hoobler stated that water rates did not increase. Presently, water rates are \$37 minimum per month plus \$5.25 per 1,000 gallons for usage from 1,000 to 50,000 gallons and \$4.75 per 1,000 gallons above 50,000 gallons. Engineering on this project was provided by Bartlett & West, Inc., Topeka. Walters-Morgan Construction, Inc., Manhattan was the contractor at the water plant and Ehrhart Excavating, Hoyt, KS was the pipeline contractor.

It has been a long wait but hopefully with the plant improvements recently completed, the weekly and sometimes twice weekly task of changing out filters will be history. I encourage you to contact me through the KRWA office at 785-336-3760 or email me directly at bert@krwa.net for any additional information on water treatment or operations.

*Bert Zerr is currently a consultant with KRWA. He has been with KRWA for the last four years. Bert was a District Engineer with the KDHE in the Salina District Office for thirty-two years.*



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**Rick Penner**  
NACE # 4853 Inspector

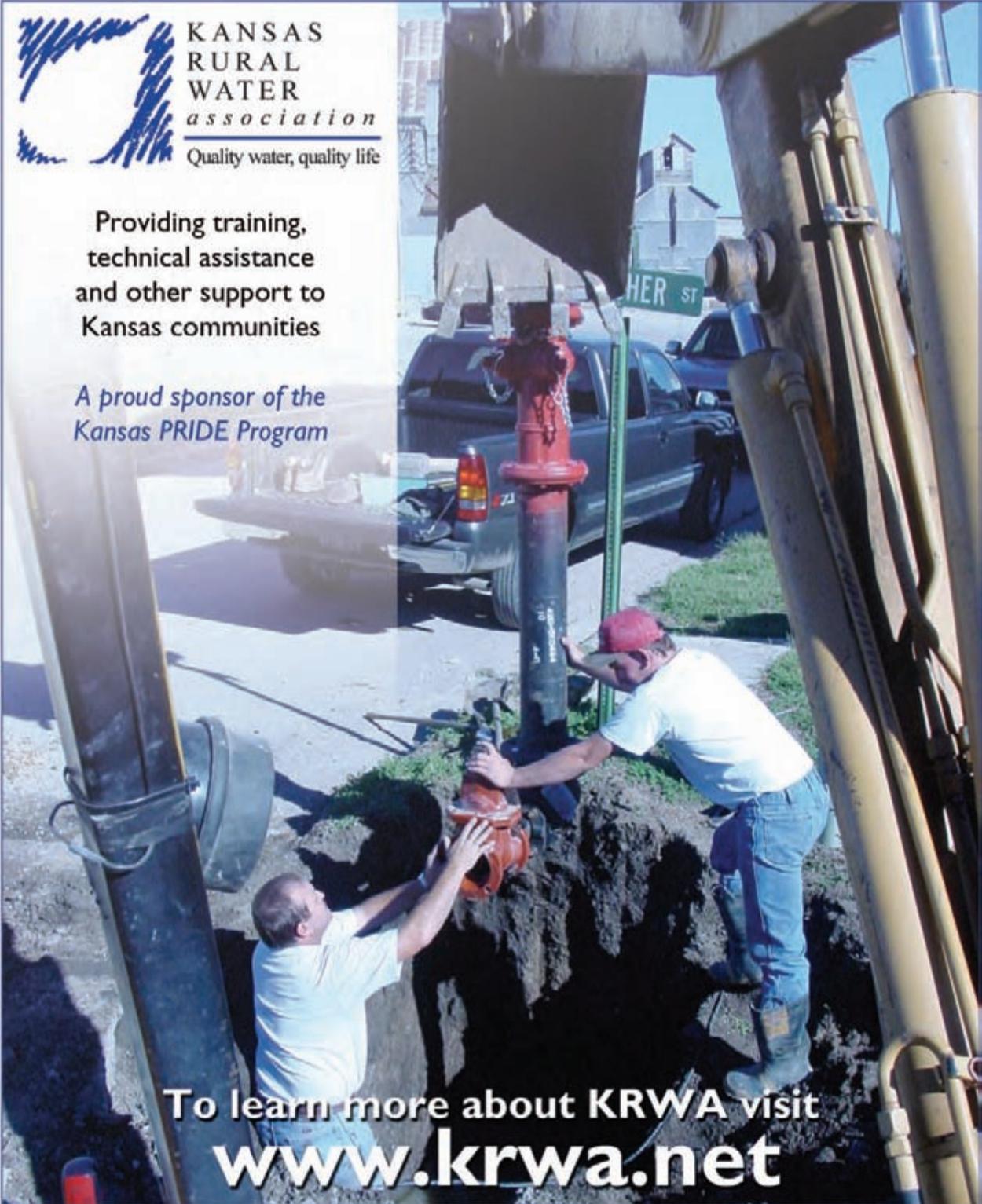


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