



Rural Water Training & Tech Assistance Program For SDWA Compliance

Small Water System Case Study



★ City of McFarland

City of McFarland, Kansas
Population Served: 256

Drinking Water Treatment Compliance Assistance



This photo shows the large solution day tank used prior to changing out the chlorination equipment at the city of McFarland, KS. The operator was diluting 10% sodium hypochlorite on a daily basis and at times would find the tank empty when he would return to check the system. The original pump was over-sized for the rate of the water flow through the plant.

Background

On September 19, 2014, the Kansas Department of Health and Environment (KDHE) issued a request for technical assistance by the Kansas Rural Water Association (KRWA) to the city of McFarland. McFarland is located in Wabaunsee County in northeast Kansas. The city's population is only 256; the city has a total of 134 water service connections. The city's water source is from two wells that when pumping together, supply only 22 gallons per minute. The city's treatment plant consists of ion exchange softening.

Technical Assistance Provided

Initially, the assistance by KRWA focused on providing help and advice concerning the disinfection of water. The new operator, Fred Beavers, was issued an Operator-in-Training (OIT) certificate by the KDHE. The city had recently lost their certified operator and with the issuance of the OIT certificate to Fred, KDHE requested KRWA to provide on-site operator training. The Association routinely provides training of new operators with some funding support through a contract with KRWA and administered by the agency.

This report was originally submitted to the National Rural Water Association and US EPA as an example of the type of assistance provided by Kansas Rural Water Association. This assistance was partially provided as the benefit of a contract funded by US EPA and administered by National Rural Water Association.

In subsequent visits with the operator and Mayor Tom Dillingham at the plant, there were discussions about the effectiveness of the disinfection process. Fred, as a new operator, was not familiar with the treatment processes that utilized sodium hypochlorite. Because of variation in the rate of injection, the chlorine residuals fluctuated greatly. During one meeting, KRWA recommended changes in the operation of the softening plant including replacing the meter in the raw water bypass line to control the bypass and finished water hardness.

Also, during the meeting, KRWA staff members Delbert Zerr and Lonnie Boller reviewed the existing ion-exchange softening process. Raw well water flows through the softening tanks; then softened water flows into an 8,400-gallon clearwell. From the clearwell, the water is pumped to a 53,000-gallon standpipe. KRWA staff member Lonnie Boller recommended some procedures that would improve the chlorination process using the existing equipment but suggested the existing equipment was over-sized. The over-sized equipment made it very difficult to maintain the proper chlorine strength in the solution tank. Lonnie suggested the city purchase a smaller solution pump and smaller solution tank that would allow the operator to pump sodium hypochlorite at full strength from the tank. Also, by eliminating the mixing, the process would be much safer; the tank would allow for about five to seven days of operation before refilling.

Another improvement discussed was to provide a means to bypass some of the raw well water around the softening tanks. By blending some raw well water with the softened water, the city would reduce costs of salt used in the softening process as well as providing customers with water that would be somewhat lower in sodium. The sodium level had been as high as 240 mg/L in the treated water. There is no Maximum Contaminant Level (MCL) for sodium but the level recommended by KDHE in drinking water is 100 mg/L. It was noted that the plant was originally provided with a bypass line and flow meter but the valve on this line was closed because of a leak at the meter. Association staff member Lonnie Boller recommended the flow meter be changed out to allow for blending raw water with softened water. In addition to the issues noted previously (saving money on salt and lowering the sodium in the water to customers), the water with a higher total hardness concentration, somewhere in the area of 100 to 120 mg/L, would be less aggressive to metal piping. After discussing the issues, Tom Dillingham, Mayor, agreed to these changes and suggested that KRWA proceed.

On October 8, 2014, Association staff members Lonnie Boller and Tony Kimmi traveled to McFarland to follow through with the recommended improvements. Lonnie and Tony changed out the chlorination equipment, installing a smaller solution tank and new smaller peristaltic solution pump. Also, a new meter was installed in the raw well water bypass line. Piping and equipment were adjusted to accommodate these improvements. The system was placed into service with close monitoring of the treatment process.

On November 18, 2014, KRWA Consultant Delbert Zerr again met with Operator Fred Beavers at the water plant. Fred noted that with the installation of the new equipment, the chlorine residual was being maintained at a very consistent 1.59 mg/L leaving the plant and 1.0 to 1.3 mg/L in the distribution system. Also, Fred commented that he only needs to add chlorine solution to the solution tank every five days. Fred and Delbert conducted a test for Total Hardness; the result was 68.4 mg/L. Delbert suggested to increase the raw water bypass flow. KRWA recommended that regular testing and adjustments be made in the bypass line until the Total Hardness tests show consistent results in the 100 mg/L range.

The city is very pleased with the present operation as they reported in a letter of appreciation dated November 19 to Kansas Rural Water. City Clerk Larry Senne concluded the letter with this remark: "Assistance programs like this make it possible for small towns and communities with limited resources to stay current and offer safe water."



This new solution tank and a peristaltic pump were installed by KRWA Tech Assistants Lonnie Boller and Tony Kimmi. This equipment is appropriately sized for the low rate of flow through the plant. The city's two wells only produce a total of 22 to 25 gpm.



This new meter was installed in the bypass line to allow raw well water to blend with softened water. The goal is to produce water to customers that will be lower in sodium and not as aggressive to metal piping as water with very low Total Hardness.