

Chlorine residual maintenance: concern for subsequent systems

Since last summer, I have been assisting Jackson County RWD 3 to address the problems in maintaining good chlorine residuals throughout the distribution system. The district provides water to 1,683 users and also serves the cities of Soldier, Circleville, Dennison, Mayetta, Netawaka and Whiting. The district operates nearly 700 miles of distribution system.

The district purchases a large portion of its water from the Public Wholesale Water Supply District 18 (PWWSO 18) water treatment plant located just west of Holton. The treatment plant treats water from Banner Creek Reservoir. The district is required by contract to purchase a minimum of 8.146 MG per month from the wholesale

plant. The district also operates a well water treatment plant located south of Whiting and several wells north of Holton.

Jackson County RWD 3 has been working with PWWSO 18 to determine if increased chlorines residuals from the PWWSO water

treatment plant will reduce the need for rechlorination in the district's system. The higher residuals helped to better maintain residuals but did not necessarily solve the problem totally by itself. The higher residuals are most needed in Kansas during the hot summer months beginning roughly in July and ending sometime in mid or late November depending on the weather.

Especially during warmer weather, the combined chlorine residual leaving surface water treatment plants in Kansas may need to be in the range of 3.0 - 3.5 mg/l or higher to significantly help maintain residuals in the distribution systems including any consecutive systems. Many treatment plants have a residual even higher in the range of 3.5 - 4.0 mg/l during this time.

PWWSO 18 did increase the chlorine residual leaving the plant to help the district maintain chlorine residuals. During warmer weather conditions, the district needs to maintain a minimum of at least 2.0 mg/l combined chlorine residual throughout and at the far ends of the distribution systems to discourage and reduce bacterial growth.

residuals are not maintained. Biofilms are microorganisms that grow on the inside surfaces of water lines and storage tanks. Biofilms are not pathogenic and do not necessarily show up in required bacterial testing for coliform bacteria. Biofilms grow first and mainly in storage tanks and in low flow or dead-end lines.

Many water supply systems in Kansas using surface water as a raw water source have to perform a free chlorine "burnout." A burnout is changing from a combined chlorine residual in the distribution system to a free chlorine residual. Free chlorine is a much stronger disinfectant and it will kill off the bacteria.

When PWWSO 18 plans on performing a burnout, the district

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It is necessary to have high combined chlorine residuals to eliminate bacterial growths because combined chlorine is a much weaker disinfectant than free chlorine. There should be no taste or odor problems encountered with these high combined chlorine residuals unless the residual is reacting (killing) bacterial growths; after the bacterial growths are eliminated the taste and odor will go away.

Biofilms may occur in the distribution system if adequate

will switch their wells over to free chlorine and also do an extensive flushing of the towers and distribution system. It is the district's objective to have the well systems make up for the water being flushed to help turn the combined chlorine to free chlorine in the distribution system and thus more quickly burn out the combined chlorine.

A burnout should be conducted for at least two weeks or more. Extensive flushing should be carried out during the burnout to



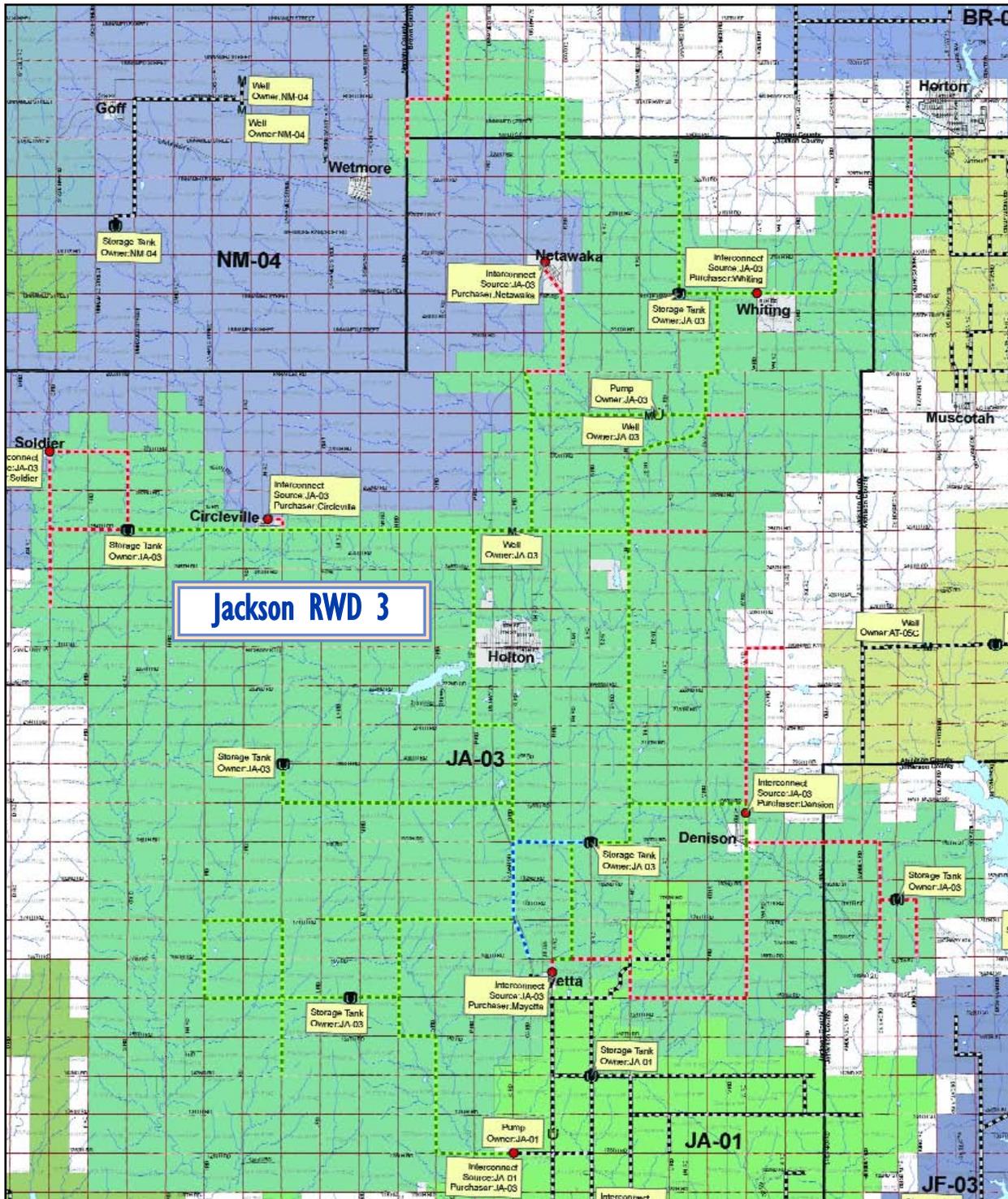
Lonnie Boller
Surface Water Tech

ensure success. Any burn-out should be coordinated with KDHE to make sure that required sampling for disinfection byproducts (DBPs) does not occur during or immediately after the burnout. If such sampling occurs

during the burnout, the DBPs will most likely be very high and unrepresentative of the overall, water quality that the customers receive.

A chlorine residual is important as its presence is an important

indicator that contamination has not occurred and the water is safe to drink. State regulation requires that a minimum of 1.0 mg/l combined chlorine residual or 0.2 mg/l of free chlorine residual be maintained throughout and at the



far ends of the distribution system. This can be a difficult challenge when a consecutive system does not have direct control over chlorination of its water

The district also has flexibility in what sources are used and to what extent. It is advantageous to the PWWSD water plant operations to be able to plan ahead on water production needs. The district works closely with PWWSD 18 in order to take water consistently overtime on a daily or weekly basis in order to make treatment plant operations more uniform.

The district recently decided to purchase three chlorine analyzers that will be installed at the district's booster stations. These analyzers will send a signal to computers in the main office and the trucks of the operators. The stations will also be set with an alarm system. This will help the operators better determine if there is a chlorine problem and its location. If the free chlorine burnout does not work effectively

to maintain desired chlorine residuals, a rechlorination system at all three sites will need to be installed.

When dealing with combined chlorine, it is important to

The combined chlorine residual level from rechlorination can only be as high as the ammonia level in the water will allow. In general, this means that the residual can only be raised to

All consecutive systems and their water suppliers must work closely together if adequate chlorine residuals are to be maintained. However, it is the responsibility of all consecutive systems to maintain the required residuals in their systems; thus, rechlorination may be needed especially during the summer and fall months.

understand the chemistry of chlorine and ammonia reactions and to take and record precise and accurate chlorine residuals. Also, there are additional considerations that need to be addressed when rechlorinating water that has had ammonia added to form combined chlorine.

the level that probably left the treatment plant. However, if ammonia is also lost in the water due to biofilms, then the combined chlorine residual cannot be increased to the level that left the plant. Ammonia addition may also be needed where rechlorination is practiced.

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KRWA has worked extensively with many water systems to resolve water treatment issues. KRWA staff members are available to attend meetings, particularly board and council meetings to explain water treatment concerns. Just give us a call at 785/ 336-3760 or email me at Lonnie@krwa.net.



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