

Combined chlorine residual loss; determine the start and extent



The logo says it all – “Quality On Tap!” This tank serves a southern Kansas rural water district.

Pat McCool, Consultant for KRWA, as well as other KRWA staff, have a great amount of experience helping water systems address loss of combined chlorine residual. The most difficult period of the year for loss of combined residuals in water distribution systems is from summer to early fall. That is because the ammonia added to form combined chlorine is a food source for nitrifying bacteria that can grow when the

water temperature range is around 77 - 82°F or higher.

“The water temperature usually heats up to that temperature range first in elevated storage tanks and standpipes,” McCool says. “This is usually where the chlorine residual loss first occurs. If the problem is not addressed at the storage tanks or standpipes, then the chlorine residual loss may spread into and throughout the distribution lines,” he notes.

Monitoring storage tanks and standpipes

“Water system operators should monitor the chlorine residual at storage tanks and standpipes so that the chlorine residual loss problem is detected early. When taking residuals, the operator is looking for low residuals to determine the amount of residual loss. Thus, the water sample should be taken when storage tanks or standpipes are at the lowest water level just before the filling cycle begins. This represents the lowest residual leaving the tank,” McCool says.

For storage tanks and standpipes that both fill at the bottom and discharge at the bottom, the water with the lowest chlorine residual is the water at the top. Thus, in addition to taking a residual when the tank or standpipe is at the lowest water level, the operator should also overflow the tank and take a residual of the overflow to determine the lowest residual in the tank.



The city of Hesston, Ks recently completed construction of a larger storage tank, replacing an existing elevated tank.

Randy Norris, operator for Cowley RWD 5, takes a chlorine residual to monitor and adjust rechlorination of combined chlorine residual water that the District purchases from the city of Winfield.



Operational plans

Once the extent of the residual loss, if any, is known, then the operator can determine how to address the problem. The first and sometimes most important objective is to solve the chlorine residual loss problem at the tank or at least keep the problem from spreading. Thus, the operation of the storage facility is important.

How an operator addresses the problem at a tank or at a standpipe will vary depending on particular tank/standpipe sizing and location, the water system daily demand, and the ability to increase chlorine residual levels at the point-of-entry and any rechlorination locations. Thus, the operator must evaluate how his system might be expected to respond to the different operational plans that he might select.

Some possible operational plans include increasing or decreasing the volume of water between the high-level turnoff and the low-level start; operating the tank with less water stored, that is, more daily water “turnover”; overflowing the low chlorine residual at the top of the tank out of the tank; or increasing chlorine residuals at the point of entry (POE) or rechlorination locations.

In summary, chlorine residuals must be taken at storage locations to determine if and when a chlorine residual loss problem begins. Some systems have installed continuous chlorine residual monitoring and recording equipment on the inlet/outlet

line to the tank to better monitor the tank situation.

If a problem does develop, then the operator must evaluate and implement an operational plan to contain or eliminate the problem at the storage facilities. If this is not possible and the problem spreads to the distribution lines, then a free chlorine “burnout” of the distribution lines, storage tanks, and standpipes will be needed.

If you want assistance in setting up a monitoring plan of water storage facilities or evaluating different operational plans, contact KRWA and staff will be glad to discuss these matters with you.



The standpipe serving the city of Downs is one of the oldest, if not the oldest, standpipes in Kansas. Note the tank is riveted steel plates.

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