By Jon Steele, KRWA Technical Assistant

Can Birds Get Into Your Water Storage Tank?

This photo shows a new elevated tank under construction for a rural water district in Kansas. Many water systems have erected new storage facilities.

Well, blame me for an attempt at a sensational headline and graphic on this article but, as much as it may be a surprise, the question is not completely rhetorical. Are your city's or RWD's storage tanks looking good from the outside, and an attraction to passers-by? How's the inside, or the foundation; is the tank really serviceable? Those and other questions are the subject of this article.

This manway is a tight fight for anyone. Adequate diameter of a manway is essential for subsequent operation and maintenance of water storage facilities.

KRWA recently sponsored three tank workshops; Tom Stechman of Utility Service Company was the presenter. A total of sixty-six people attended the sessions in August at Maize, Lyons and Abilene. The sessions provided good, practical advice for proper maintenance, routine operation and design of water storage tanks. Let's begin with "good design."

Over the years with my work at KRWA, I have found many storage tanks that had problems with vents. Also, overflow piping often does not completely come to down to the ground. Safety climb apparatus is often not installed – and the list goes on from there. Some of these shortcomings are inherent on older tanks constructed in the early 1900s. Other concerns are undersized roof hatches, and no curbing around the hatch to keep rainwater or bird droppings out. Some tanks have ladders that roll around the tank bowl instead of being solidly attached. Safety issues are the number one concern that must be addressed before anything else. There have been deaths in Kansas due to accidents that resulted from falls, in one case due to a broken ladder.

I'm not practicing engineering or setting design criteria, but in my opinion, manways should be at least twenty-four inches in diameter; thirty-six inches would be even better. The larger openings allow for easier ingress and egress and for more light and better ventilation during maintenance. If all designers were required to get through a twenty-four inch opening, perhaps there'd be more attention paid to the size.

Effects of storage on chlorine residuals

I recall on numerous occasions finding bird skeletons inside of a tank while helping a system inspect their tank or when performing routine maintenance on tanks that had not been opened for several years. Yes, parts of those birds were gone – and you can fill in the rest of the story yourself. The fact that birds entered a tank is due to poor design or workmanship during construction or repairs. A thorough inspection and maintenance plan would prevent such incidents. There are many other horror stories where things that don't belong in tanks were found.

For example, a Kansas RWD could not keep adequate chlorine residuals in the system. The problem was traced back to a storage tank. It was during the heat of the summer; the tank was less than one year old. The system was pumping enough water to have cycled the tank almost daily. One would assume that there should have been no problem in maintaining a chlorine residual. The tank was drained, inspected, cleaned, and disinfected. Welding rods and old coveralls were found in the tank.

This issue of *The Kansas Lifeline* includes an excellent article beginning on page 30. Among other issues, the author, Randy Moore of Utility Service Company, discusses stratification of water in storage tanks and the degradation of water quality that often results. This is particularly so when storage tank capacity is in excess of reasonable need and therefore, minimal exchange of water in the tank occurs. In some systems, "subsequent" tanks are also sometimes "locked up" due to ineffective control systems such as altitude valves that are overridden by incoming pressure.

I encourage system operators who are faced with problems maintaining chlorine residuals inside storage tanks to contact KRWA. The Association has several rechlorination stations that can be connected directly to water systems to induce additional chlorine. This past summer, some systems flushed millions of gallons of water just to improve chlorine residuals. Purchased water can cost anywhere from $1.50 to more than $8 per thousand gallons in Kansas. It does not take many months of wasting water to make a big down payment on rechlorination equipment, much less reduce the waste of good water.

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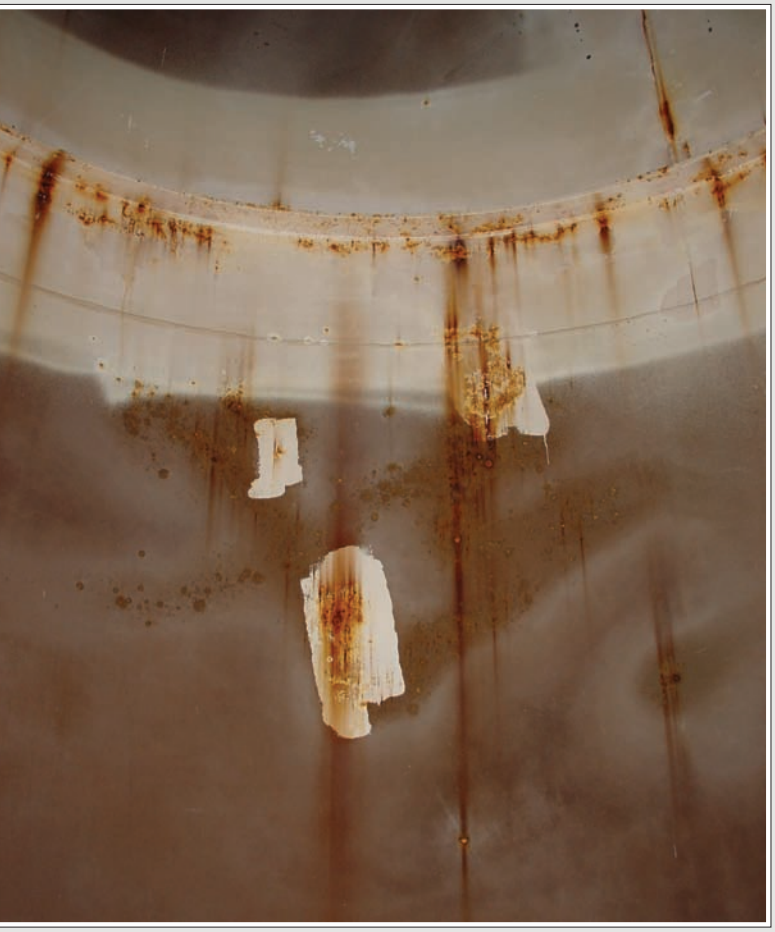
I once worked with a RWD that had such significant problems of low chlorine residuals that I recommended they take the tank out of service during the summer months or add a circulation system to their standpipe. It was possible to take the RWD tank completely out of service because the system it was purchasing from had very high capacity



A botched paint touch-up job inside of this storage tank for a RWD in Kansas will require additional work.

pipelines and plenty of pressure and storage nearby. The selling system was also at the same elevation as the RWD. The RWD's tank could have even been eliminated from the original design and the RWD's customers would have had the same pressure. Anyway, we simply eliminated the RWD tank during the hot summer months. It reminds me of the project that failed to receive bids within the funding limits and so the consultant simply eliminated the storage tank. Well, the system either needed a storage tank or it didn't.

Methods to circulate water inside of storage tanks are becoming more and more popular. Special check valves on the fill line can also be incorporated to help force an exchange of water from the storage tank. One system uses a special valve that closes a check valve near the bottom of the tank at just above the sediment line. When the tank is filling, water flows out near the top of the bowl to mix the older, warmer water with fresher and cooler water. Then when the pumps are off and water is being used from the tank, the check valve opens to let water flow from the bottom of the tank. This system uses the typical design with the same fill and discharge line. In time this may prove to work out satisfactorily; I don't have enough experience with this system to know yet. There are some cities and RWDs that have tried to use separate fill and discharge lines. This would be similar to the system described above. I think the new continuous mixing system will prove to be the best.

Winter operation has its own problems with the severe cold temperatures in Kansas. Ice can damage interior coatings, cause uneven loading that results in structural stresses, and in some instances, even cause splitting of riser

pipes and fittings or even solid freeze-ups, rendering the tank useless until it thaws. Ice can form on the sides or the top of the tank. A new circulation system would be a good way to help prevent such damage.

What about antennae on a tank?

I am asked from time to time about antennae on water tanks. Well, there is a lot that can be said on that subject. My first thought is that the primary purpose and design of a water tower is to provide storage for potable water versus being a support structure for communication antennae for the telecommunication industry. Next, I offer that the antennae are often rather unsightly at best. Also, the mountings and cables can cause damage to a tank if not installed properly. There are also many safety concerns as a result of this equipment not being installed properly. In the recent training session sponsored by KRWA, there were several operators who cited numerous problems with communications equipment installed on their systems' tanks. These included hatches that could not be opened properly, safety climbs that were rendered unusable, structural damage, etc. Other questions concerned costs of future maintenance. Who is responsible to remove and reinstall the gear for sandblasting and recoating? What will the additional cost of maintenance be with the equipment installed? Will there be other safety concerns, such as access? Those are questions to resolve in a contract before signing on to having communications gear installed on a public water system water tank.

There are no doubt some positive aspects to allowing a water tank to be used as a base for communications equipment.

Undoubtedly, there are positive aspects to allowing a water tank to be used as a base for communications equipment. Other than the fact the water tower may be the only way to get high-speed Internet service in a small town, the revenue is really the only positive I see about the whole idea. Such leases can be a really good source of revenue for some small systems. But beware though there are some companies that have come in and have taken advantage of small systems that were not familiar with such equipment. Be sure you get a fair price in any deal – for sure something more than "free Internet" – and make sure you submit any contract proposal to legal counsel for review.

Your storage tank is likely to be one of the highest cost investments of your public water supply system; take care of it and it will take care of your storage needs for years to come. KRWA is available to discuss storage tanks and maintenance; call KRWA at 785-336-3760 or email me directly at jon@krwa.net.

Jon Steele has been employed by KRWA as a Circuit Rider since 1995. Jon is certified as a water and wastewater operator. He has more than twenty-five years experience in public works, construction and industrial arts.