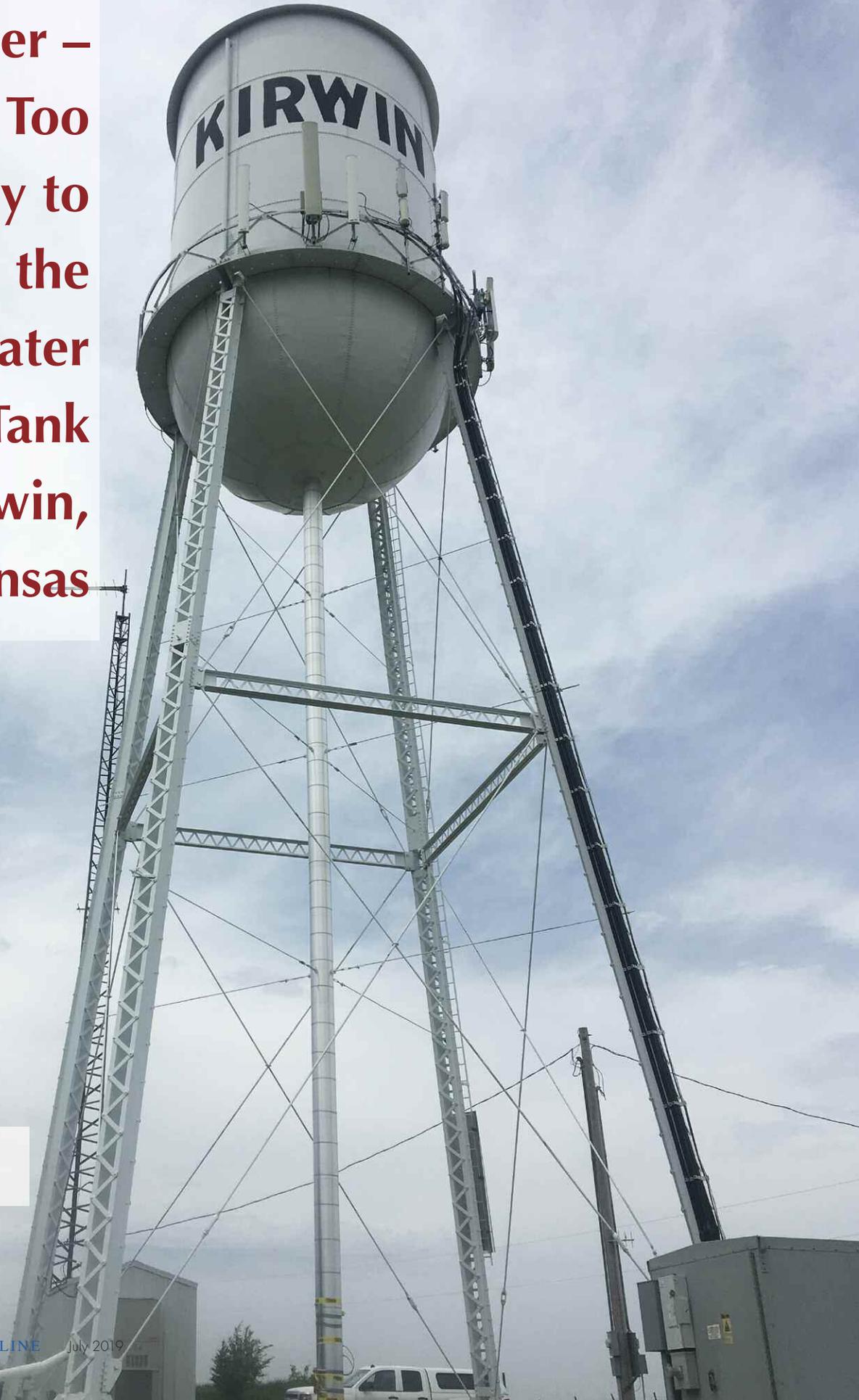


**It's Summer –
and Not Too
Early to
Review the
Frozen Water
Storage Tank
in Kirwin,
Kansas**

This photo shows the city of Kirwin, Kansas' 50,000-gallon elevated storage tank.



On February 27, 2019, I received a call from the water operator at the city of Kirwin. He commented that the systems was experiencing erratic pressure and complaints were being registered by customers. His review of the system operations indicated that the monitoring at the chlorination building showed a full elevated storage tank and then an empty tank within a matter of a minute or two.

Kirwin is located in southeastern Phillips County in north-central Kansas. The town’s population is slightly fewer than 200 people in 87 households. The Kirwin City Hall is unique and is listed on the National Register of Historic Places. The city’s water is provided from two wells approximately six miles northeast of the town. In-home treatment is utilized to reduce nitrate content of the water.

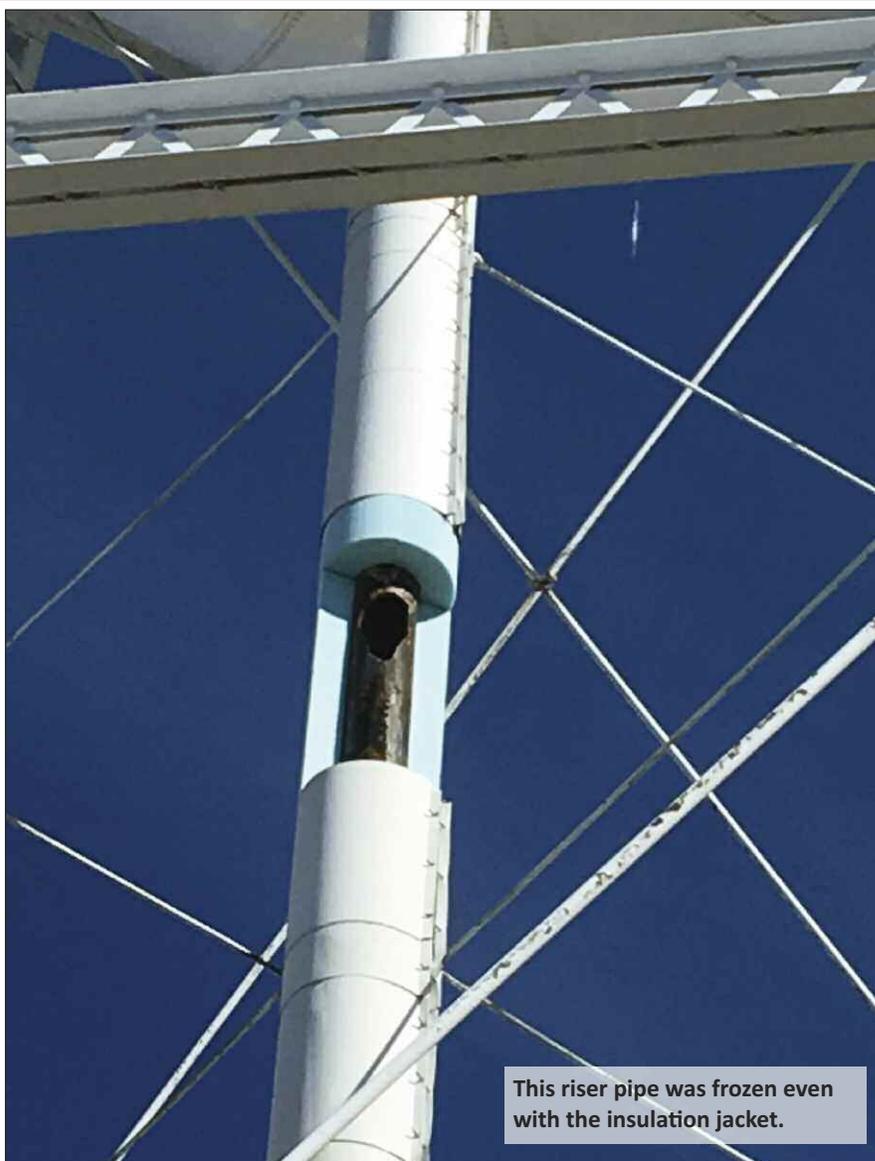
As anyone living in the Midwest is aware, the winter of 2018-19 was very cold and also brought substantial moisture. It seemed there was either an ice storm or a snow storm in the weather forecast.

With subzero temperatures and high winds the night of February 26, and hearing the operator’s explanation, we soon determined that the water storage tank was frozen from the system. The riser pipe, which extends 60 feet to the tank, had to be frozen somewhere from the base to the tank. The tank is a 50,000-gallon legged tank. The city water storage tank is located on the far west side of the town.

Where to begin?

In order to address the problem, we installed a pressure relief valve on a fire hydrant and then proceeded to continuously operate one well. We were able to achieve a consistent pressure between 48 and 54 pounds. The chlorine residual was also monitored; it ranged from 1.5 to 2.0 mg/L.

I instructed the operator to allow the isolation valve on the elevated tank to remain open. We hoped for some thawing to occur in the riser pipe. Instead the temperature remained very low for the next several days.



This riser pipe was frozen even with the insulation jacket.



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When the pipe finally thawed twelve days later, the damage was evident. The riser pipe had been frozen several feet above ground – and to our surprise, the isolation valve had also frozen. That valve had four feet of cover! The freezing also damaged the isolation valve which now could not be totally closed.

The city had insurance coverage for damages such as this. The underwriter was contacted on this matter. The insurance company wanted photos of the damage before they could decide about coverage. I stated that one of at least three water storage tank maintenance companies be contacted on this matter. The insurance company insisted on having photographs. The dilemma was that the tank in Kirwin has an insulation jacket on the riser pipe and it was covering the damaged pipe.

Another five days elapsed and the jacket portion that covered up the damage had finally dislodged; some of the damage could be photographed. Then the insurance company decided it could send an adjuster to photograph the damage. The adjuster thought a local company could be utilized to



make the necessary repairs. I strongly disagreed and stated that companies that specialize in this kind of work are not located in north-central Kansas.

After this the adjuster decided he was not experienced in this kind of damage due to the type of facilities. The company then allowed the inspection by one of the water storage tank service companies. My suspicion was that the first adjuster was

pretty frustrated with the situation. Another problem was that the city water system was losing 100,000 gallons of water per day and their water rights permit limits would likely be exceeded.

After another month, a plan for the repairs was decided on and a service company was contracted for. The damage was much more extensive than first anticipated because of the riser not



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being visible due to the frost jacket. After all the insulation jacket was removed the entire riser pipe exhibited damage from frost expansion. The full length of the riser needed to be replaced as did the isolation valve.

But after there was agreement on the scope of the repair project, with the contract signed, the floods and freeze damage of the upper north-central United States created a major work overload for the tank service company. That caused a further delay for the project at Kirwin.

While all this business was taking place, I was trying to figure out how to make a well system and telemetry that is pre-programmed with a 5-minute delay in start and stop of pumps to reduce the wasting of water. The pressure would spike so fast even after installing one of KRWA's portable pressure tanks that the only way to maintain system pressure and chlorination was to vent off a pressure relief valve method. Installing the expansion tank on the transducer location did not work. Nor did displacing half of the pressure tank with air not work in conjunction with the telemetry system.

At the time of writing this article the tank repairs are planned and the hope is to return to normal operation by late May, maybe. That's a lot of downtime for a small system to endure because of the freeze-up on February 27.

Preventing tank freeze-ups

This past winter was a challenge for water system operators to minimize or prevent tank freezing, especially on systems where usage is low and when temperatures are below normal. The city of Kirwin is planning to install a heating tape type of system under the new insulation jacket to hopefully prevent future problems with riser freeze-up. The advice to water operators is to allow storage tanks to draw down much more than normal during extreme cold periods. There have been numerous problems when tanks freeze, include collapse. Resupplying with fresh water will introduce water with a higher temperature. The design of the system is also a contributing factor, for example, if the tank is situated where water does not readily exchange. Another water system that I have

KRWA staff have more than 550 years of water and wastewater operating experience.

assisted has installed a circulation pump in the tank which they credit for reduction of freezing.

KRWA staff have more than 550 years of water and wastewater operating experience. Give a call or let someone know if anyone can be of help to any public water or wastewater system.

Doug Guenther has worked as a Technical Assistant for KRWA for 16 years. Doug worked for the City of Oakley in the Water and Electric Department for eight years. He has also worked several years for an industry supplier. Doug is a Class II Certified Water Operator.



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