by Doug Guenther

Save that well before it collapses

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This summer several systems in western Kansas that use groundwater as their public water supply source were met with real challenges. Due to continued drought conditions in some areas, many water wells are operating with excessive drawdown. That is especially true in the Solomon Valley alluvial. During severe drawdown conditions the water entering the well casing increases in velocity. This can result in moving sand and silt into the well, which increases turbidity. Additional problems that I've worked on this summer were caused by similar circumstances. I've helped troubleshoot chlorinators and some nearly new production meters. Sand, being pumped by the supplying wells, was the problem in many cases.

Doug Guenther
Tech Assistant

This summer, a well in Dorrance that I have been troubleshooting and helping the city maintain for several years started pumping air. The previous operator and council members told me this has happened at other times during dry weather conditions. They reported that the well returned to normal when it rained again. To their knowledge however, the well had never pumped sand and silt. My review indicated that excessive drawdown was an issue. However, the water level recovered quickly when pumping stopped. Working with city utility crew members, I assisted in performing a maintenance and cleaning of the well. This helped increase the capacity of the well. Flow into the well was improved; less air was introduced by the pump. However, I noticed fine sand being pumped at the time we shocked the well with a high chlorination to remove iron bacteria.

Recently I received a phone call requesting that I troubleshoot the city's chlorinator. I drove to Dorrance, checked the chlorinator and quickly saw fine sand had plugged the injector portion of the chlorinator. This caused intermittent operation of the chlorination equipment. A sand screen had not been installed upstream of the booster pump. Such installations should always have a sand screen.

Sand, silt and large aggregates had entered the well through holes in a failing casing.

***Left:** Silt, sand and chlorine being flushed from the Dorrance well. The sand was observed when the well was shocked in order to remove iron bacteria.*
***Below:** A bacteria colony resides on the pump pulled from the well.*

Left: *The well service truck and crew bailing the Dorrance well.*
Below: *A handful of sand and iron particles that were bailed from the well.*

Weeks later, the operator informed me that the master meter stopped functioning. Inspecting this two-year-old meter, I found the bearings trashed and the turbine with extensive erosion to the turbine blades. This was all due to pumping sand. We installed another sand screen at the exit of the submersible well pump to protect both the meter and second screen in front of the chlorinator booster pump.

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One month later the chlorinator was failing weekly due to plugged sand screens along with a drop in production. Also adjustments for the application of chlorine needed to be made as production varied. This was difficult for a new operator to understand. I suggested that the well casing be video taped; my fear was that the casing was failing or even starting to collapse.

I mentioned my experience with helping two other water systems that had problems with well operations. Both systems had wells with failures in the well casings. One well collapsed and buried the pump. These wells were lost. New wells will need to be installed. My guess would be that the average cost for drilling wells of similar type would easily average $50,000. Neither of those systems has that much cash on hand.

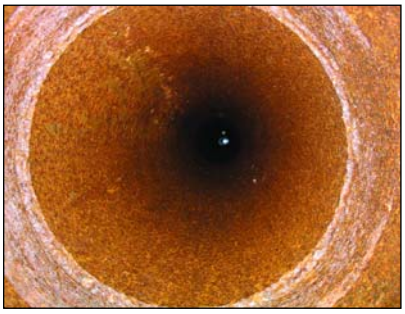
Reline?

Water well casings can be relined. When a well casing has eroded enough to allow sand and silt to be introduced to the pump, it's time to act. If enough of a problem exists, distribution pipelines can be loaded up with sand.

A good bailing of any material that has silted into the well and the installation of an undersize casing can save the well. One well that I helped review and work on had 16-inch mild steel casing. The well was approximately 40 years old.

After pulling the pump and removing what seemed to be about a half a yard of iron flakes from the old casing, sand and large stones to the size of walnuts were bailed from the well. New 10-inch PVC was used to line the old casing; a 30 foot section of perforated screen was installed. After the insertion of the new PVC casing, chlorinated river rock or large gravel was pored between the old and new casings. This will keep the old casing from collapsing any further and the new perforated section will stop sand from entering the well.

This relining job cost about $2,300. After a month of pumping, sand has not been a problem. The best part is that the well is producing water at the rate of the original design specifications. This well was pumped hard for 4 hours to remove the chlorine solution before putting it back into service. I am pleased to learn that the well is operating very satisfactorily and efficiently. It is rewarding to see results for a community at such reasonable costs.



Above: *A well service crew member works at inserting the new perforated casing section during the Dorrance well relining process.*
Left: *A view down a section of the rusted and eroding old well casing.*