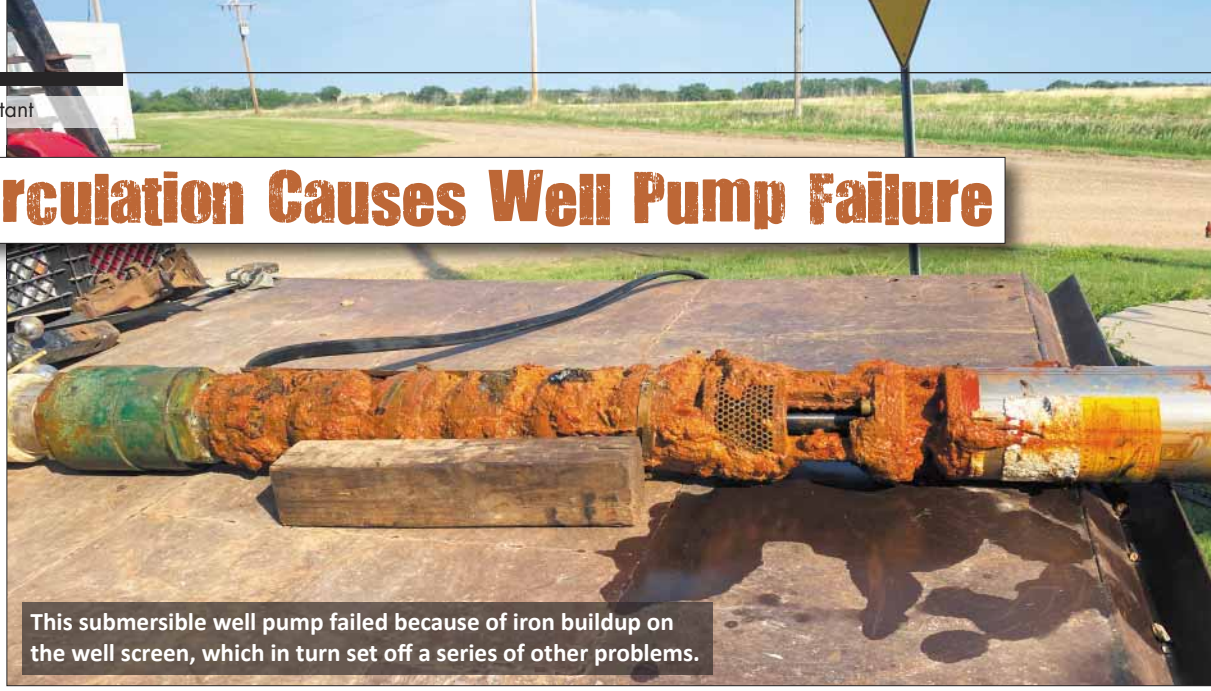
By Doug Guenther, Technical Assistant

Iron Turberculation Causes Well Pump Failure



This submersible well pump failed because of iron buildup on the well screen, which in turn set off a series of other problems.

Small water systems with low populations can often fall short of some preventative well and pump maintenance issues that will result in well failure. I just recently assisted a small system to do just that with my old reliable method of using super chlorination to keep the well screen and pump clean. The process doesn't always work – but super chlorination is the most economical to employ when there's a lack of resources and it's the easiest.

A small city recently contacted me to see if the well yield could be improved to use one of their wells as a bulk water sales supply. When we began, we determined the pumping rate and we measured the drawdown. At 35 GPM this water level would almost be at the intake screen in less than 30 minutes of run time. This did not bode well as the goal was to have a yield of 80 to 100 GPM. I suggested that the most economical treatment that we could try was to super chlorinate the well. That would likely indicate if the well screen could be cleaned and provide more flow. There were no historical records about this well or the pump that was installed.

The operator and I took the well offline. We introduced 15 gallons of eight percent (8%) sodium hypochlorite. We allowed the well to rest for several days.

When I returned, we began pumping the well to waste. Chlorine residual was still very high, but we noticed that not much if any mineral material being present in the flushing process. We then tried to pump the well. The yield was 35 GPM and the drawdown was identical to the pre-chlorination process. It became obvious that the well treatment failed to make any desired improvement. We decided that if any more testing was to be done, a professional service company would be needed.

Two weeks after the above experience, in another small town, that city's Well No. 2 stopped producing water, yet the pump motor continued to operate on the submersible unit. After the pump was pulled by their well service company, the motor and pump look like a rusted popsicle and my records indicate that the last super chlorination (or what I refer to as a preventive maintenance cleaning) was almost six years ago. I know that with a total hardness of 550 mg/L, chlorination should be an annual event.

The pump was pulled and inspected and the first problem noted was the motor drive shaft splines were stripped and unable to turn the pump. An insulation breakdown test indicated the motor was near thermal failure and deemed shot. The foot valve or bottom check valve had failed and the spring and valve seat were damaged. Heavy iron tuberculation was deposited throughout the pump and the intake screen was partially blocked. Finally, the pressure transducer was partially blocked by iron deposits and pressure readings were slowed by this limiting the effectiveness of the variable frequency drive to do its job.

With all the problems identified, the pump column pipe would empty and fill with air so, on each pumping cycle, air would compress and cause water hammer. The variable frequency drive was not operating properly because the pressure sensor was limited by a blockage. The pump bowls had iron deposits making the motor work harder.

This pump was installed new in 2011. This unit could likely have provided many more years of service had the well been treated with super chlorination annually. The new pump for this small town will cost $7,550 plus installation. The well will be acidized and chlorinated before being put back into service. Those costs are not known at the time of this writing.

If money and downtime were not an impedance, I believe the well should be inspected with a camera and if super chlorination does not keep the condition ahead of the iron depositing, then a more aggressive cleaning is needed to prevent total pump failure when the well doesn't have high-quality water.

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.