By Doug Guenther, Technical Assistant

Troubleshooting Tips for Gas Chlorinators

When a gas chlorinator malfunctions, it is common for operators to automatically blame the regulator. In my experience, this is usually the last component to fail. I find that vacuum leaks and injector problems are far more common reasons for a gas chlorinator to fail.

Chlorinators meter and deliver a set feed rate of chlorine gas from the cylinder. Chlorinators operate by a vacuum that allows the chlorinator to open; the vacuum then pulls the gas through the regulator and rotometer, and then injects the chlorine into the water at the application point. Without a vacuum, the chlorinator cannot operate.

A few standard tools that are needed for troubleshooting a failed gas chlorinator are a vacuum gauge with rubber-cone, end-fitting and a box knife for squaring the vacuum tube for a better seal. Necessary tools for chlorinator cleaning and maintenance include a large flat-blade screwdriver, a set of water pump pliers, silicone-based lube, pipe cleaners and denatured alcohol. Muriatic acid may also be needed to clean the rotameter component and any body bolts that are corroded. Muriatic acid is the most effective way to remove the corrosion. If not cleaned, the corrosion will begin again in a short time. After any cleaning with water and muriatic acid, a follow-up cleaning needs to be done with denatured alcohol. The alcohol will remove moisture from the parts. The parts must be dry in the regulator head and rotameter before reassembly.

For small chlorine leaks, use a squeeze bottle partially filled with ammonia and a sponge to "puff" the ammonia on and around the regulator, especially where it connects to the cylinder. When the ammonia vapor mixes with chlorine, a white "smoke" will appear indicating a chlorine leak. KDHE requires that operators have ammonia available at each gas chlorination site to test for leaks. The regulator is the only area where the high-pressure leaks should occur. Operators should perform a leak test every time a cylinder change is performed.

When KRWA receives a call concerning a chlorinator failure, it is beneficial to have the gas cylinder on an accurate scale to first establish that there is

Troubleshooting a gas chlorinator includes checking for adequate vacuum.

chlorine available. Many systems require a booster pump on the chlorine system to increase the water feed pressure going through the injector. Installing a pressure gauge on the injector line is beneficial, and a quick way to check pump or well production pressure. The booster pump pressure needs to be ten percent more than the well line pressure for an adequate vacuum to be produced to operate the regulator's head. Many times, this ability to check pressure is missing.

Next, check the injector with a vacuum gauge. The injector pulls air through the vent line of the chlorinator during operation. While the unit is operating, remove the vent line and check the vacuum reading on the unit. To avoid getting a face-full of chlorine gas, make sure you remove the line marked VENT or VACUUM and not the line going to the injector. The vacuum pressure on the vent line usually needs to be -12 PSI or more. The highest pressure I remember recording was -28 PSI, but most units will show -8 to -24 PSI. An old manual that I had indicated that -15 PSI was needed to operate the regulator reliably. I contend that -12 PSI is adequate for the diaphragm to reliably operate.

On occasion, I will see an erratic vacuum reading. This needs to be checked on the injector. In such cases, there is usually air in the water on the

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booster pump suction side. On centrifugal pumps, the main shaft bearings can wear out, and leaking water is evident; such a condition can allow air to be introduced. A water well that pumps air can be a problem. That condition can create an airlock. If the pump is air locked, opening and closing the inlet valve will usually clear the air. If allowed to continue to operate, booster pump damage can result from running in a dry condition.

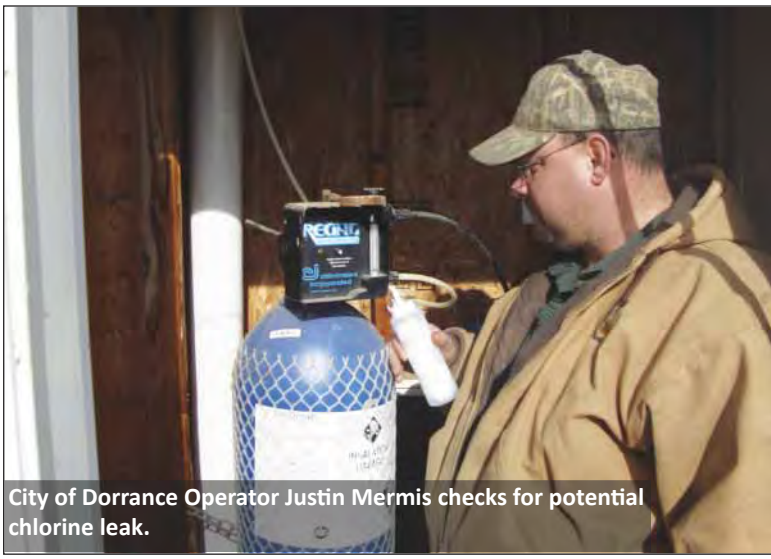
After vacuum has been established at the injector, the troubleshooting can move on to the regulator. If there is a drop in vacuum pressure, the line probably has a leak between these points. In my experience, the vacuum measured at the injector and bottom of the rotameter should be the same. Without a proper vacuum the regulator will not open and allow gas flow. An operator must ensure a tight fit with no air leaks from the injector back to the regulator. Do not loosen any fittings while the cylinder is open! Shut the cylinder valve before checking the lines for a vacuum to avoid getting gassed.

If a vacuum gauge is not readily available, an operator can still check for adequate vacuum. After making certain the chlorine gas cylinder is closed, start at the injector and check the vacuum at each connection with a thumb. If there is a good vacuum at the connection, check the next connection upstream. Repeat until a leak is found.

Next, we troubleshoot the cylinder and regulator. As I mentioned, this is least likely where problems occur. Still there can be failures from time to time.

A new lead washer needs to be used after every chlorine cylinder change. Be sure the old lead washer is removed. I have found a few leaky regulators that were caused by having multiple washers in the regulator. These were difficult to see. The cylinder valve needs to be clean and the filter in the regulator inlet free of debris before installing. Many operators never check this, but on occasion, it will result in a plugged-off flow. Most leaks on the regulator are pressure leaks. If the cause is not at the valve, then the diaphragm may have a hole in it or the O-rings may be worn out.


A tubing cutter ensures square cuts on vacuum tubing or a proper seal.


City of Dorrance Operator Justin Mermis checks for potential chlorine leak.

Another problem is to have a crack in the body itself. These leaks are located with the ammonia and puffer bottle that was mentioned before. A cracked body is usually difficult to find or even see. Typically, such breaks occur only after five or more years of use. When this occurs, the rotameter appears to work and can be adjusted but no chlorine will be in the finished water. This is because the injector is sucking air through the rotometer instead of chlorine gas. This same situation can occur when a leak forms on connections and/or lines at the base of the rotameter. I can usually figure out which condition is occurring when an operator describes the situation in a phone call.

Kansas Rural Water Association will include troubleshooting of chlorinators and chlorine safety on numerous training sessions this year. Keep an eye out for those on the training calendar at www.krwa.net/training. And, don't hesitate to give a call or send an email to KRWA or directly to a staff member if we can be of help in discussing the problem and providing help.

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.