

## **You Can't Just Dump It on the Ground!**

*A good chlorination job involves protecting the environment.*

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In my columns I have discussed disinfection, what concentrations of hypochlorite to use, how to administer it to the well and some of the factors that can make the process more effective. Now let's talk about how to finish up a good chlorination job and – more importantly – how to protect the environment and just maybe keep from getting a stiff fine.

The controlled discharge of a chemical comes under many different federal and state regulations. However, the U.S. Environmental Protection Agency regulates most chlorine discharges through its Water Quality Criteria program. This program dictates that solutions containing no more than 1 mg/L or part per million (ppm) chlorine can be discharged to the ground or to flowing waterways.

This may not be the only regulation under which they can seek control. There are regulations that govern watershed contamination and storm water

runoff that may be used to control the discharge of chlorinated water. Many states have similar or more stringent laws. The limit is 0.1 mg/L chlorine in California, Oregon, Nevada, West Virginia, and Maryland.

We in the ground water industry have been guilty of discharging very high levels of chlorine, particularly if you take into consideration that often we disinfect without a true knowledge of the level at which we chlorinated the well. While most of the current regulations deal more with discharge into or near flowing water, we have to take into consideration the high concentration of chlorine solution we generate and the proximity of our discharge to the well. Speaking more directly, we may not be contaminating a flowing stream, but what impact are we having on the aquifer below?

In an attempt to be better stewards of our own industry and of the aquifers that afford us a livelihood, let's develop a system of chlorine

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removal or neutralization to use following a well chlorination. Some questions:

1. Can we neutralize downhole before we pump the well to discharge?
2. What is the normal method used to de-chlorinate the discharge water?
3. What are the chemistries that can be used to neutralize the chlorine?
4. How do I calculate the amount of chemical required?
5. Are there any particular problems I need to watch for?

Most neutralizing chemicals available for use in the well industry will in themselves result in some detrimental changes to the well. Some result in precipitates or deposit formation or residual material that could instigate increased bacterial activity. These, plus water quality requirements, dictate the need to neutralize aboveground.

Two methods have been used. One is to discharge to a holding tank and apply the neutralizing chemical as the water enters the tank. The other is to add the chemical as the water is being pumped directly to discharge. The latter method is not as easily adapted to our work due the considerably higher levels of chlorine used and the changing of the chlorine concentration as the water is pumped from the well. In the method with a holding tank, you will be able to measure the chlorine content and apply the exact dosage to the water. Even when the volumes to be pumped exceed the tank capacity, it is easier to calculate an approximate addition rate for the neutralizing chemical. The tank will allow some time for adjustment before discharge.

### Dechlorinating Chemistry

I have listed some of the various chemicals, which can be used for dechlorination in the accompanying chart (Figure 1). Most of these chemicals can be purchased at the local wholesale company; however, the minimum purchase often is far more than required. These products are a reducing chemistry, which means they will oxidize in air and lose their effectiveness, limiting their use at a later time. Some commercial

products on the market are packaged in smaller volumes and in airtight containers, which allow better storage.

Product	Amount Required (mg/L)	Lbs per 1000 gallons
Ascorbic Acid	1.92	0.016
Sulfur Dioxide	0.90	0.008
Sodium Bisulfite	1.46	0.012
Sodium Sulfite	1.77	0.015
Sodium Thiosulfate	0.70	0.006
<i>Reference: Water Quality and Treatment, AWWA, 3<sup>rd</sup> Edition, McGraw Hill 1971</i>		

**Figure 1.** Various Dechlorination Chemicals

The standard for a good chlorine neutralizer is one that does not affect the pH and the dissolved oxygen level of the discharge. While most reducing agents have some effect on the dissolved oxygen, products based on sodium dioxide and sodium sulfite and bisulfite are known to reduce the dissolved oxygen. If water treated with these particular chemicals, or with excessive use of reducing agents in general, comes into contact with a flowing stream, the action could result in suffocation of any fish present. While there are tests kits available to determine exactly to what degree excess chemistry has been used, the best defense is to first calculate the proper dosage as you begin.

And that brings us to the fourth question that we asked. Figure 1 has formulas for the various raw products. The trick will not be the calculations, but the determination of the chlorine levels. By “levels,” I am referring the level of the chlorine in the water you are pumping out of the well and the level of chlorine that may remain in the water to be discharged. Remember, you can discharge only 0.1 mg/L in some states and 1 mg/L in the rest. There are some good test kits on the market that should help you determine the level of chlorine present. You will need a test for both the high chlorine level and one for the lower concentration or discharge water. This will assure that you not only use the correct amount of chemicals but also are in compliance with the regulations.

## Charting the Various Test Kits

The test kits that read the higher levels usually give very poor or insufficient readings of concentrations at or close to zero. This necessitates the use of a separate test kit to verify compliance.

Manufacturer	Type	Effective Range (mg/L)
Hach	Test strip	0 – 10.0
	Drop test	0.2 – 4.0
	Drop test	10 - 200
Industrial Test Strips	Test strip	0.6 – 4.0
	Test strip	0 - 750
Van Waters & Rogers	Test strip	0 - 120
WSE Inc.	Test strip	0.6 – 4.0
	Test strip	25 - 750

**Figure 2.** Available test kits.

The basic procedure is to estimate the water you will discharge from the well to adequately flush the chlorine solution. Provide for a tank sufficient to hold the discharge or a portion of it. Measure the chlorine level of the water and calculate the dose of the neutralizer required. If the water is pumped into the tank in batches, the neutralizer can be added to the tank and circulated. The water is then measured again, this time with the low-level test kit. If sufficiently dechlorinated, it can be safely discharged; if not, additional treatment can be added. Be careful not to over treat.

If you are pumping a large volume of water and using the tank as a temporary holding reservoir, you should make a dilution of the neutralizer and pump the chemical into the line feeding the tank. In this instance, you will be neutralizing in the flow and you will have to check both the discharge (for no or limited chlorine) and the discharge from the well so that you can reduce the chemical addition pump as the level of chlorine in the well water is lowered.

The biggest problem is overtreatment. While the degree of trouble this will cause depends a lot on where you are discharging, overtreatment of any type cost money. Overtreatment can result in removal of the dissolved oxygen from a flowing

stream or pond, which can result in suffocation of any fish in that body of water. Use of the testing procedures that were mentioned will prevent this and allow judicious use of the dechlorinating chemical.

## The Future

I know this procedure appears to be a lot of work, considering we just discharged the chemistry to an out-of-the-way area that the customer designated so as not to hurt the landscaping. The well industry is entering into a new era and we must become proactive in the upgrading and protection of the resources on which we rely. It is up to us to show the regulatory agencies that we understand the necessity of keeping the environment safe and are judicious in the proper use of chemicals. It won't be easy because part of our job will be to impress on the well owner the need for them to carry their share by paying higher fees for the additional work and equipment required.

The tank and chemical feed pump and even the testing kits can be part of upgrading your presence at the well site. Before you decide on a specific tank and other equipment, review what other activities for which it can be used. A properly sized on-site tank can be used to mix and administer both disinfection and cleaning chemicals to the well in sufficient volume to greatly improve your success in both of these procedures.

The tank will also be useful in neutralizing any acid cleaning solution used during a well cleaning. While I will cover this procedure in a future column, start planning now. The addition of a few pieces of equipment can upgrade your program and make us all better stewards of our environment. *WWJ*

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