Shock Chlorination of Well Water – An Example[0]

Note: The procedures below are "general" chlorination procedures. Producers, storage intermediaries and packers are advised to determine if there are any municipal guidelines for chlorination.

1. What is Shock Chlorination?

Shock chlorination is a self-administered method used to treat bacterial contamination in wells. Bacteria grow on the inside of the well casing, pipes and pumping equipment. Contamination can cause a reduction in well yield, a restriction in the water flow in pipelines, a red staining of plumbing fixtures, the plugging of water treatment equipment and a ''rotten egg'' odor. In order for shock chlorination to be an effective means of controlling bacterial growth, it must disinfect the entire cased section of the well in addition to the adjacent water-bearing formation (e.g., storage tank, etc.) and the entire water distribution system. It is important to note that shock chlorination does not completely eliminate bacterial growth, but it does help to control the problem. Shock chlorination is recommended as a regular well maintenance procedure and repeated each spring and fall. Shock chlorination may also be used to disinfect wells in the event of flooding or contamination (e.g., run-off).

2. Shock Chlorination Procedure for Drilled Wells

1. Store sufficient water to meet the needs of the family and entire farming operation for 8 to 48 hours. The well will not be in use during the chlorination procedure.
2. Pump the appropriate amount of water from Table 1 (see below; column titled ''Volume of Water Needed'') into a clean storage tank (e.g., galvanized stock tank, pick-up truck box lined with 4 mil plastic sheeting). Note that the recommended amount of water is twice that of the volume present in the well casing. Allow the well to return to its non-pumping (static) water level before adding the chlorine solution.

*To calculate how much water is in the well casing: subtract the non-pumping (or static) water level from the TOTAL depth of the well.

Table 1. Amount of Chlorine Required to Obtain a Chlorine Concentration of 1000 ppm

Casing Diameter		**Volume of Water Needed**		**5.25 % Domestic Chlorine**	**12% Industrial Sodium Hypochlorite**	***70% High Test Hypochlorite**
		Water needed per 1 foot of water in the casing		**Liters needed per 1 foot of water**	**Liters needed per 1 foot of water**	**Dry weight* per 1 foot of water**
Inches	**mm**	**Gallons**	**Liters**	**Liters**	**Liters**	**Grams**
4	100	1.1	5	0.095	0.042	7.2
6	150	2.4	10.9	0.21	0.091	15.6
8	200	4.2	19.1	0.36	0.16	27.3
24	600	**extra 200 gallons	** extra 1000 liters	1.7	0.74	127
36	900	**extra 200 gallons	** extra 1000 liters	3.8	1.7	286

* Because a dry chemical is being used, mix it with water to form a chlorine solution before putting it into your well.
** See modified procedure for LARGE DIAMETER wells.

EXAMPLE – How to calculate how much water you will need to pump into a clean storage tank:

• Your drilling record indicates that the casing is 200 feet in length and that the non-pumping (static) water level is 100 feet. To determine how much of the casing holds water, use the following equation:

length of casing – non-pumping water level = length of casing holding water
200-100 = 100 feet of casing holding water

• If your casing has a diameter of 6 inches you need 2.4 gallons of water (from Table 1) for every foot of water in the casing. To calculate the amount of water you need to pump into your storage tank, use the following equation:

Liters or gallons/ft. of water (determined by casing diameter) X ft. of casing holding water = liters or gallons of water needed to pump into storage tank
10.90 liters X 100 ft. of water = 1090 liters of water into storage tank

3. Calculate the amount of chlorine required as indicated in Table 1. Mix the proper amount of chlorine with the water you have pumped into the storage tank. This will give you a solution with a chlorine concentration of 1000 ppm. Always follow the chlorine manufacturer's instructions for use.

Note: *If your well is located in a pit, ensure that there is proper ventilation during the chlorination procedure.*

EXAMPLE – How to calculate how much chlorine you will need for your well:

• If your well casing is 6 inches in diameter and you are using 5.25% domestic (household) chlorine, you will need to use 0.210 liters of chlorine (from Table 1) per foot of water in the casing.

• If you have 100 feet of water in the casing, calculate the total amount of chlorine you will need by using the following equation:

liters of chlorine needed per ft. of water in casing X ft. of water in casing = liters of chlorine needed
0.210 liters of chlorine per ft. of water X 100 ft. of water = 21.0 liters of 5.25% chlorine

4. Slowly siphon this solution back into the well. Do not exceed the well pumping rate.

5. Open EACH hydrant and faucet (including all appliances that use water) in the distribution system until the water coming out has a chlorine odor to it. This ensures that all plumbing fixtures will be chlorinated. Allow the hot water tank(s) to fill completely. Once this has been done, turn off all hydrants and taps.

Note: *Consult with your water treatment equipment supplier to find out if any part of your water treatment system needs to be bypassed to prevent damage (i.e., corrosion due to chlorine). Do not run chlorinated water through softeners, carbon filters and reverse osmosis systems.*

6. Leave the chlorine solution in the well and distribution system for a period of **8 to 48 hours**. The longer the contact time, the better the results.

7. When the contact time has elapsed, open an outside tap and let the water run until the odor of chlorine is significantly reduced.

Note: *Direct the water away from crops and other sensitive areas (i.e., ponds, grasses, etc.).*

8. Flush the chlorine from the hot water heater and household distribution system (if applicable).

9. Backwash and regenerate/recharge all water treatment equipment. The system is now ready to be used.

3. Modified Shock Chlorination Procedure for LARGE DIAMETER Wells

1. Pump approx. 200 gallons of water into a clean storage tank located at the wellhead.

2. Mix 20 liters of 5.25% domestic chlorine (or 8 liters of 12% chlorine or 1.4 kg of 70% high test hypochlorite) into the 200 gallons of stored water.

3. Use Table 1 to calculate the amount of chlorine required per foot of water in the casing (see calculations for drilled wells). Add this amount of chlorine DIRECTLY to the well.

Note: *If you are using 70% hypochlorite, the dry chemical must be mixed with water prior to being added to the well.*

4. Circulate the chlorine added to the well using a garden hose that is hooked up to an outside faucet. Place the end of the hose into the well and turn the tap on for a minimum of 15 minutes.

5. Siphon the 1000 liters of chlorine solution (made in Step 2).

6. Follow Steps 5 through 9 for DRILLED wells as described above.

4. Disinfection Verification

Sample the well *5 days after the shock chlorination treatment and again at least one week after the well has been in constant use*. Two consecutive ''safe'' water test results are required before the well can be considered disinfected.

References:
Alberta Agriculture and Food. Shock Chlorination – Well Maintenance. Copyright 1995-2007 [retrieved December 31, 2007]. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/wwg411

Government of Saskatchewan. High Level Chlorine Well Disinfection (Shock Disinfection). . Copyright 2007 [retrieved December, 31, 2007]. http://www.health.gov.sk.ca/water-well-disinfection-chlorine-highlevel

Other Information Source(s):
http://www.mddep.gouv.qc.ca/eau/potable/depliant/index.htm - French web site from Developpement durable, Environnement et Parcs Quebec (also available in English).

Conversion factors:
1 liter = 0.22 gallons
1 gallon = 4.54 liters
1 cm = 0.4 inches
1 m = 39.4 inches or 3.28 feet
1 inch =2.5 cm
1 foot = 30.5 cm