



## **RECOMMENDATIONS FOR THE TREATMENT OF DRIP IRRIGATION SYSTEMS WITH CHLORINE**

### ***WARNING!!***

Active chlorine solutions are dangerous to human beings and animals. So, the Manufacturer's instructions must be followed very carefully. When using chlorine, proper protection for the eyes, hands, and body parts must be worn, i.e. glasses, gloves, shoes, etc. Chlorine contact with the skin can cause serious burns, contact with the eyes can cause blindness, and swallowing may be fatal.

Prior to filling any tank with chlorine solution, be sure it is absolutely clean of fertilizer residue. Remember that direct contact between chlorine and fertilizer will create a thermo-reaction, which can be explosive. This is extremely dangerous!!

**NOTE:** The direct contact of chlorine and fertilizer in the irrigation water after it has been injected into the system is not hazardous.

### **OBJECTIVES**

Active chlorine is a strong oxidizer and as such, is useful in achieving the following:

- A. Prevent clogging and sedimentation of organic substances.
- B. Destroy and decompose sulfur and iron bacteria, as well as accumulated bacterial slime in the system.
- C. Improve performance of filtration systems while reducing back flush water.
- D. Clean systems of organic sediments. (Chlorine has no effect on scale deposits.)

### **MATERIAL**

In the market, a few sources for active chlorine exist, such as liquid chlorine (sodium hypochlorite), solid chlorine, gaseous chlorine, etc. The most commonly used sources are chlorine solutions and gas.

### **METHOD OF APPLICATION**

Chlorination is the injection of specific concentrations of active chlorine into the irrigation system during regular system operation. When liquid chlorine is used, common devices used for fertilizer applications can possibly be used to chlorinate.

In principal, three methods are recommended:

1. Continuously: at very low concentration - the most recommended.
2. Intermittently: at a higher concentration.
3. Shock treatment: very high concentration (> 50 ppm).

**CONCENTRATION AND INJECTION POINT**

It is important to remember that chlorine concentration decreases as time and distance from the injection point increases. The lowest concentration will always be found furthest from the injection point. The injection point should be as close as possible to the treated system.

The required concentration of active chlorine is a result of the chlorination objective.

CHLORINATION OBJECTIVE	APPLICATION METHOD	REQUIRED CONCENTRATION (Parts per Million)	
		System Head	System End
Prevent Sedimentation	Continuous Chlorination	3 - 5	.05 - 1
	Intermittent Chlorination	10	1 - 2
System Cleaning	Continuous Chlorination	5 - 10	1 - 2
	Intermittent Chlorination	15 - 50	4 - 5

When the purpose of chlorination is improving filtration performance, the injection point should be close to the filtration plant to assure even distribution throughout the filters. Chlorine concentration downstream of the filter battery should be no less than 1-2 ppm for constant chlorination and three times more for intermittent chlorination.

For continuous chlorination, the injection should start after pressurizing the system. For intermittent chlorination, the procedure should be as follows:

- Start: By flushing the system with clean water. Flush the mainlines first, then the manifold lines and finally the drip lines by opening several lines at a time so that enough pressure is maintained to get a vigorous flush. Flush the lines for about 1 minute or until the water is clear. Close the open lines and open several more drip lines.
- Injection: Inject required amount over time, preferably at the beginning of the cycle.
- Contact Time: Preferably one hour, but not less than thirty minutes.
- Flush: At the end of the process, open the end of the line, flush out and run fresh water for an hour.

**CALCULATION METHOD**

Use the following information to determine the proper injection rate of chlorine in terms of GPH for liquid and Lbs./hr. for gas.

**LIQUID:**

1. Choose the proper chlorine solution factor:
  - 5% Chlorine Solution: The factor is = 20
  - 10% Chlorine Solution: The factor is = 10
  - 15% Chlorine Solution: The factor is = 6.7
2. Multiply the solution factor by the treated flow in terms of GPM.
3. Multiply by the desired chlorine concentration in terms of ppm.
4. Multiply by the conversion factor of 0.00006 (which accounts for GPM to GPH and the million in PPM)
5. The result will be the required injection rate of chlorine in terms of GPH

*For example:*

The chlorine solution is 10%.

The flow is 100 GPM.

The desired chlorine concentration is 10 ppm.

Chlorine Solution Factor	x	Flow GPM	x	Desired Chlorine concentration (ppm)	x	Adjustment Factor	=	Chlorine Injection Rate GPH
10		x 100		x 10		x 0.00006	=	0.6

**The injection rate of chlorine solution will be 0.6 GPH**

**GAS:**

1. Determine the flow of the treated zone in terms of GPM.
2. Multiply the flow by the desired chlorine concentration in terms of p.p.m.
3. Multiply it by the factor of 0.0005.
4. The result will be the injection rate of the gas in terms of lbs. per HOUR.

*For example:*

The flow is 100 GPM

The desired chlorine concentration is 10 ppm.

Flow		Desired Chlorine		Chlorine Injection
GPM	x	Concentration (ppm.)	x 0.0005	= Rate (lb./hr.)
100	x	10	x 0.0005	= 0.5

**The injection rate of the gas will be 0.5 Lb./hr.**

**TRANSPORTATION STORAGE AND DILUTION**

Sodium hypochlorite is transported by tanks. It should be stored in a clean tank without any remnants of fertilizers. The tanks should be painted white and placed in a shaded area. In field storage should not exceed 20 days. In case of gas chlorine, transportation, storage and general handling should be carried out in accordance with the manufacturers' specific instructions under supervision of the relevant authorities.

**INJECTION OF FERTILIZER AND CHLORINE**

The contact of free chlorine in water and nitrogenous (ammonium and urea) fertilizer creates the combination of chlor-amine which is called "combined chlorine". Hence, if possible, avoid any application of ammonium or urea fertilizers together with chlorination.

In the case that chlorination is required, it is recommended to ask your local Extension Service for assistance in the computation and application methods.

There are alternatives to using chlorine to kill algae or eliminate organic matter. Materials based on hydrogen peroxide, which are less sensitive to plants, are available. Please consult with the suppliers of those products on how to use them.