



Newsletter, Volume 2

## SOME TIPS ABOUT CHLORINATION

- Liquid chlorine (usually sodium hypochlorite) oxidizes everything it can in water -- iron, manganese, sulfur, sulfur dioxide (rotten egg smell), etc. -- and kills bacteria as well. Put enough chlorine in the water and it will oxidize and kill everything it can, leaving a residual that can be measured with a test kit. **Any level of measurable residual chlorine means that the oxidation and kill have occurred.**
- Most chlorinators use common household bleach, which is typically 5.25% sodium hypochlorite. Look for a generic bleach that isn't contaminated with additives.
- Commercial swimming pools should turn their volume over for treatment at least every 6 hours, so figure 4 or more turns per day to size a pump.
- Commercial bleach, which is readily available from swimming pool suppliers, is usually 12.5% sodium hypochlorite. **One gallon of 12.5% chlorine bleach is approximately equivalent to one pound of dry chlorine gas in treatment capacity.**
- **The half-life of a chlorine solution is approximately 30 days**, depending upon its concentration, temperature, etc. A 5.25% solution will deplete over 30 days to a strength of about 2.5%.
- The amount of chlorine solution you'll need to feed will be a measure of the chlorine demand required for the oxidation/kill and the chlorine residual (the amount extra put in to be able to measure with a test kit). An easily measurable, yet consumer-acceptable, residual is 0.5 parts per million (PPM). If the user objects to the residual chlorine, a carbon filter can be used as a following treatment stage to remove the chlorine.
- **Contact time is an important part of achieving an effective chlorine oxidation and kill.** The chlorine solution you inject needs time to thoroughly mix with and treat your water supply. The hypochlorite ions need to make physical contact with the bacteria and oxidizable matter present to react with and nullify them. Hence contact time, or retention time. As a rule of thumb, a 5 PPM residual after 5 minutes of contact, or a 1 PPM residual after 30 minutes of contact, will accomplish an effective oxidation and kill.

## ANSWERS YOU'LL NEED TO SELECT A CHLORINE FEED PUMP

- **How many gallons per minute (GPM) of water will be treated with chlorine?** Guesses count, and minimums and maximums will help.... The test kit residual will determine final pump settings and the concentration of chlorine you'll need to use.
- **What concentration of liquid chlorine would you like to use?** Please note that splashes of chlorine over 1 % solution strength will make holes in your clothes... they get oxidized! Chlorine solutions can be easily diluted with water (Note: A number of our customers have diluted their chlorine stock solution with hard, rather than soft, water. This has led to sediment in their solution tank, as well as plugged pumps and injectors).
- **How many parts per million of chlorine would you like to apply to the water you're treating?** Jar testing might help -- how many drops from an eyedropper of your selected chlorine concentration does it take to leave a residual in one liter of the sample water? Problem water might require more, but generally 1-5 PPM is enough for most applications.
- **If the chlorination is into a pipeline, what is the line pressure? Is the water flow rate constant, or does it vary?** What is the line size, and what type of line is it (PVC, copper, cast iron, etc.)? Are you pumping into a tank or reservoir?
- **What are the physical circumstances of your application?** This will tell you what accessories, if any, will be needed to complete the system you are putting together -- for example a flowmeter, chlorine solution tank, pump mounting shelf, etc.

The calculations below will size a chlorine feed pump in gallons per day (GPD), as if the water to be chlorinated was running all the time during a 24 hour day. When your water is actually flowing, your pump will need to feed at this rate. Whatever you determine your pump GPD output requirement to be, at least double that number to select a pump so that it will operate near midrange. This will increase your flexibility when you deal with the physical realities of your application.

## HOW TO SIZE A CHLORINE FEED PUMP

Experience has developed a constant which, when multiplied by the **whole number** of the chlorine solution concentration (in percent) that your feed pump will be pumping, will tell you the number of gallons of water that will be treated (GT) to one part per million by one gallon of that chlorine solution. That constant is the number 10,000.

$$\text{GPM of Water} \times 60 \text{ Minutes per Hour} \times 24 \text{ Hours per Day} = \text{GPD of Water}$$

$$(\text{Chlorine \%} \times 10,000) / \text{PPM} = \text{GWT}$$

$$\text{GPD of Water} / \text{GWT} = \text{GPD of Chlorine}$$

If you guess at both the maximum number of gallons per minute you might need to treat, and the amount of chlorine needed, these formulas will give you a rough sizing for your pump. You might select 10 GPM and 2 PPM if you are treating a household water with no special problems. Jar testing would help you to be more precise about the actual chlorine requirement.

**Example:** To allow for both chlorine demand and residual, jar testing tells you that you need to feed 2 PPM of chlorine solution. To save your clothing and minimize pump adjustments during the 30 day half life, you decide to dilute your stock solution to 0.5% (9 gallons of water, 1 gallon of 5.25% sodium hypochlorite). The maximum flow of water into the house may be around 10 GPM.

$$10 \text{ GPM} \times 60 \text{ Minutes/Hour} \times 24 \text{ Hours/Day} = 14,400 \text{ GPD of Water}$$

$$(0.5\% \times 10,000) / 2\text{PPM} = 2,500 \text{ GWT}$$

$$14,400 \text{ GPD of Water} / 2,500 \text{ GWT} = 5.76 \text{ GPD of Chlorine}$$

**Notes:** Doubling the output to work in midrange, you would need a chlorine feed pump with about a 12 GPD output. Please remember to select a pump model with enough pressure output to overcome any line pressure or friction losses in your system. Do you need any accessories like a solution tank or flowmeter?

**These formulas will work equally well if your application is commercial, industrial, or municipal.** Just plug in your numbers. If your job calls for superchlorination or electronic control, or if you'd just like some help with your system, please give us a call or e-mail.