Chemical Injection Technologies

Technical Bulletin

SUPERIOR Gas Chlorinators Sizing Guide

A wide variety of factors determine the exact amount of chlorine to be fed to produce a desired result in a given application . All gas chlorinators operate over a wide range of flow rates and usually can be converted to higher or lower ranges very easily. The maximum flow rate of a gas chlorinator is at least 20 times its minimum rate, with any capacity metering tube. The following definitions may be helpful to those who are unfamiliar with some of the basic terms used in chlorination and in water and wastes treatment:

DOSAGE: The amount of chlorine put into water or wastewater, expressed in parts per million (PPM) or Milligrams per Liter (Mg/L) of chlorine to water.

DEMAND: The amount of chlorine required to react with the organic and inorganic substances and to kill the bacteria present in the water being treated.

EFFLUENT: The liquid discharge of a treatment plant or of a piece of equipment or tank within the plant.

TOTAL CHLORINE RESIDUAL: The amount of chlorine remaining, after a specified contact period, that is still available for reaction. Basically, this is the amount of chlorine in excess of the DEMAND.

FREE CHLORINE RESIDUAL: That portion of the total chlorine residual which will react chemically and biologically as hypochlorous acid or hypochlorite ion. Generally, this is the most potent form of residual and reacts most rapidly.

COMBINED CHLORINE RESIDUAL: That portion of the total chlorine residual which will react chemically and biologically as chloramine (Chloramine is the combination of chlorine and ammonia). This form of chlorine is more volatile and does not react as rapidly as free residual.

B.O.D.: Biochemical Oxygen Demand; the required amount of oxygen necessary for the chemical and biological oxidation of waterborne substances in a specific time, under specific conditions.

PPD OR GMS/HR: Pounds Per Day, refers to the pounds of chlorine per day and/or Grams Per Hour, refers to the grams of chlorine per hour, required to do a specific job.

PPM OR Mg/L: Parts Per Million, pounds of chlorine per million pounds of water; or Milligrams Per Liter, Milligrams of chlorine per liter of water. PPM and Mg/L are numerically identically measurements.

CALCULATING THE CHLORINATOR SIZE/CAPACITY

Chlorinator size should be based on the maximum expected flow rate of the water being treated at any time. Use Gallons Per Minute (G.P.M.), Cubic Meters Per Hour (M^3/hr.), or Liters Per Second (L/sec.) of water flow rather than daily total or an average. The basic formulas for calculating chlorine feed rate are as follows:

U.S. (ENGLISH)

PPD = GPM x 0.012 x Dosage (PPM)

PPD = IMPERIAL GPM x 0.015 x Dosage (PPM)

METRIC:

GMS/HR. = M^3/hr. (water) x Dosage (Mg/L)

GMS/HR. = L/sec. (liters/sec. water) x 3.6 x Dosage (Mg/L)

EXAMPLE

A potable water treatment plant is operating at a maximum water flow rate of 2,000 gallons per minute. Chlorine demand is relatively low and a chlorine dosage rate of 1.9 PPM is needed to maintain the required chlorine residual. Following is the sizing calculation:

PPD CHLORINE = GPM x 0.012 x PPM = 2,000 x 0.012 x 1.9 = 48

Generally, it is desired to have a safety factor of 2 x required feed rate, so a 100 PPD SUPERIOR Gas Chlorinator would be specified.

(continued)

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DOSAGE GUIDE

† The dosage rates shown below in PPM or Mg/L are for average conditions, which may vary depending on location.

	CHLORINATION TREATMENT FOR	TYPICAL DOSAGE RATES IN PPM OR Mg/L†
WATER TREATMENT	**DISINFECTION**	1-10 Free Residual 1-5 Combined Residual
	TASTE	1-3
	ODOR	1-3
	ALGAE	3-5
	SLIME	3-5
	IRON & SULFUR BACTERIA	1-10 varying with the amount of bacteria to be controlled
	COLOR REMOVAL	Dosage depends on type and extent of color removal desired. May vary from 1 to 500 PPM dosage rate.
	IRON PRECIPITATION	0.64 times Fe content
	MANGANESE PRECIPITATION	1.3 times Mn content
	HYDROGEN SULFIDE - Taste & Odor Control Destruction	2 times H_2S content 8.4 time H_2S content
	COOLING WATER	1-10
	CHILLING WATER	5-25
	WASHDOWN WATER	25-50
WASTEWATER TREATMENT	**DISINFECTION:** Sand Filter Effluent Activated Sludge Effluent Trickling Filter Effluent Chemical Precipitation Effluent Raw Sewage Settled Sewage Septic Raw Sewage Septic Settled Sewage	 1-5 2-10 3-10 3-10 5-20 5-25 10-25 10-40
	B.O.D. REDUCTION: Activated Sludge Effluent Raw Screened Sewage	 5-15 5-15
	ODOR CONTROL: Up Sewer Plant Influent Trickling Filter Effluent Digester Supernatent	 2-20 2-20 2-5 200-300
	TRICKLING FILTER PONDING	5-20
	TRICKLING FILTER FLIES	3-10
	CYANIDE: Reduction to Cyanate Complete Destruction	 2.0 times cyanide content 8.4 times cyanide content

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