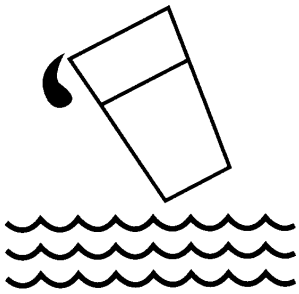
Olin Techniucal Bulletin

HTH®* Dry Chlorinator for Use in: MUNICIPAL WATER & WASTEWATER



Advantages of HTH® Dry Chlorinator: *HTH® Dry Chlorinator, which contains 68% available chlorine, is calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require expensive, complex metering equipment or large storage tanks, and doesn't lose strength rapidly during storage. Be sure to comply with all government regulations for use.*

CONTENTS

EVERYDAY NEEDS

HYPOCHLORINATION FOR DISINFECTION

Problem

No water supply may be considered adequate for human consumption unless protected by disinfection chemicals. While larger cities have long enjoyed the protection of chlorination, many smaller communities are either entirely without protection or are served by obsolete, worn-out, or inadequate gas chlorination equipment.

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Where budgets do not permit the installation or replacement of costly gas equipment to provide needed protection, the water plant will often find the low initial investment and the economical operating cost of hypochlorination well within the allocation.

Treatment

Disinfection is accomplished in two steps.

1. Enough HTH® Dry Chlorinator solution must be added to satisfy the initial chlorine demand of the water and to effectively control bacteria and satisfy other oxidizable matter present
2. Sufficient additional solution must be added to provide a chlorine residual. In usual water works practice, a chlorine residual of 0.2 ppm after a minimum contact period of 20 minutes is standard.

The usual method of application is by means of a hypochlorinator which pumps the HTH Dry Chlorinator solution into the water supply as it flows past a selected point. When a uniform rate of flow is maintained, a constant rate hypochlorinator can be used. If the flow varies, a proportional feeding hypochlorinator is the best choice. If use or volume does not warrant the usage of a hypochlorinator, HTH Dry Chlorinator solutions lend themselves well to simple gravity or siphon feeds.

The application point of HTH Dry Chlorinator solutions should be so located as to provide for thorough mixing of the solution with the entire volume of water before it enters the distribution system. The most common application points are the intake side of the pump or the intake side of the storage tank. If it is not possible to use either of these two locations, HTH Dry Chlorinator solutions can be applied at any spot where sufficient turbulence exists so that thorough mixing and sufficient contact time may be assured.

To make certain that the proper chlorine residual is always present in the required concentrations (0.2 ppm), it is advisable to initiate a regular testing routine which should be carefully administered. Simple test kits for measuring chlorine residuals may be purchased from any HTH supplier.

FILTER BED TREATMENT

Problem

Slime formations are a source of constant difficulty in maintaining filter capacity at many water plants. Mud balls, cracks and the failure of backwashing to restore filter capacity are positive signs that such growths are present. Increased chlorine demands for water treatment is usually a warning sign of the presence of slimes.

Treatment

The most effective method of controlling slimes and organic accumulations in filter beds depends on the degree to which the raw water supply is subject to such contamination.

Where filter trouble is infrequent and does not seriously interfere with normal operations, periodic treatment such as outlined below is suggested.

1. Remove filter from service. Drain filter bed to a depth of 30 cm (1 ft) above filter sand.
2. Sprinkle dry HTH® Dry Chlorinator evenly over the surface of the water so that filter bed is covered at the rate of 240 grams for each 1 square meter or 1 lb. for each 20 square feet of filter surface.
3. Allow 30 minutes for dissolving and dispersal. Then drain off water from filter bottom until it reaches a level even with top of filter sand.
4. Allow to stand for a period of 4 to 6 hours. Then drain completely and backwash. The action of HTH® Dry Chlorinator will destroy the slime formations so that normal backwashing operations will easily remove them from the filter bed.

Split Application

Where slimes and organic matter heavily contaminate the raw water supply, constant difficulty in the filter beds and throughout the treatment process is usually experienced. In such cases, split application will effectively maintain filter efficiency. This process involves the addition of available chlorine prior to coagulation, sedimentation, filtration and other forms of treatment employed, for the control of difficulties in the processes arising from slime. An additional application of available chlorine is made at the completion of these other treatments to bring the final residual to 0.2 ppm in the finished water.

In general, some of the advantages which may be derived from split application, depending on local conditions, are:

1. Improves coagulation and sedimentation of turbid water supplies.
2. Removes soluble iron (ferrous) impurities.
3. Stabilizes sludge and organic matter present in settling basin deposits.
4. Reduces bacterial content of water at all stages in treatment process.

5. Aids in avoiding phenolic "Chlorine" tastes of finished water by maintaining low chlorine residual.
6. Keeps filter sands relatively free of slime growths resulting in (a) extended filter runs between backwashes, (b) more efficient filtration, and (c) complete elimination of cracking, shrinking and mud balls in the filter bed.

Pre-hypochlorination

Small water treatment plants which experience filtration, coagulation, sedimentation or taste problems due to slime can generally or greatly improve the problem by proper employment of split-hypochlorination.

Application of pre-hypochlorination dosage should be made at a point which will ensure a chlorine residual of 3 to 5 ppm at the influent of the mixing tank (or first treatment operation).

Post-hypochlorination

Post-hypochlorination dosage should be applied after the water leaves the final plant treatment step in sufficient quantity to provide a chlorine residual of 0.1 to 0.2 ppm in all water entering the storage or distribution system.

Experience has indicated that the amount of HTH Dry Chlorinator required in post-hypochlorinating to a residual of 0.2 ppm will be in the vicinity of 10% to 20% by weight of the quantity of chlorine gas consumed in pre-chlorinating to a residual of 5 ppm. This wide variation is explained by the fact that the initial dosage satisfied the initial chlorine demand of the water.

The additional HTH Dry Chlorinator consumption will be found to be far outweighed by the savings in labor and time due to elimination of algae troubles and will usually lead to a decided improvement in taste of the finished water.

For these reasons, the larger plant with intermittent slime troubles, or the plant with limited budget for operating and capital expenditures, may well find pre-chlorination with existing gas equipment supplemented by post-hypochlorination with HTH Dry Chlorinator to be the solution to taste problems or operational difficulties arising from algae content of raw water. The low first cost of hypochlorination equipment and the small operating costs of such equipment will not substantially increase budgetary considerations.

RESERVOIRS

Problem

The growth of algae in reservoirs often causes unpleasant tastes in the finished water, clogs filters, and interferes with the efficient operation of all treatment processes.

Treatment

The accumulation of algae in reservoirs can be effectively controlled by treatment with HTH® Dry Chlorinator solutions. Small surface-fed reservoirs subject to heavy algae growths can be best controlled by continuous hypochlorination of the streams feeding the reservoir. Suitable feeding points should be selected on each stream at least 45 meters or 50 yards upstream from the points of entry into the reservoir. Feeding may be accomplished either by mechanical hypo-chlorinators or by gravity-type feeds.

SANITIZING NEW MAINS AND SYSTEMS

Problem

New water mains and new plant equipment is subject to contamination during storage, transit and installation. To insure against pollution of the water supply, such new equipment should always be thoroughly sanitized before being placed in service.

Treatment of Mains

1. Thoroughly flush section to be sanitized by discharging from fire hydrants in sequence from high pressure to low pressure end.
2. Establish sampling points (DO NOT USE FIRE HYDRANTS) for obtaining representative chlorine and bacterial samples. One of these should be at the intake point of the new main section.
3. Permit a water flow of at least 3/4 meters (2.5 feet) per second to continue under pressure while injecting HTH® Dry Chlorinator solution by means of a hypochlorinator.
4. Stop water flow when a chlorine residual test of 50 ppm is obtained at the low pressure end of the new main section after a 24 hour retention time. When the chlorination is completed, the system must be flushed free of all heavily chlorinated water.

Treatment of New Tanks, Basins, etc.

1. Before placing in service, remove all physical soil from equipment surfaces.
2. At bottom of tank, basin, etc., place 780 grams dry HTH Dry Chlorinator for each 1 cubic meter or 4 ozs. for each 5 cubic feet capacity (about 500 ppm) in such a manner that maximum turbulence may be received from incoming water.
3. Fill to working capacity & allow to stand for at least 4 hours.

4. Drain and flush with potable water and return to service.

Where capacities are too great to permit filling, equipment surfaces must be thoroughly cleaned, then sprayed or swabbed with an HTH Dry Chlorinator solution containing 30 grams for each 20 liters or 1 oz. for each 5 gallons of water (approximately 1,000 ppm). After surface is dry, flush completely - draining excess water to waste - and return to service.

Treatment of New Filter Sand

When new filter sands or replacement filter sands are placed on the bed, an even distribution of HTH Dry Chlorinator should be made throughout the new sand at the same time, at the approximate rate of 450 grams HTH Dry Chlorinator for each 5 cubic meters or 1 lb. for each 150 -200 cubic feet of sand. The action of the HTH Dry Chlorinator dissolving as the water passes through the bed will aid materially in sanitizing the new sand.

Treatment of New Wells

Before new well casings are placed in service, the inside of the casing should be flushed well with a solution containing 40 grams HTH Dry Chlorinator for each 500 liters or 1 oz. for each 100 gallons of water for purposes of sanitization (approximately 50 ppm).

HTH Dry Chlorinator solutions should be pumped or fed by gravity into the well in sufficient quantity to give a chlorine residual of 50 ppm in the well after thorough mixing by agitation. Where pumping is used, sufficient agitation is usually produced to provide thorough mixing. Otherwise, compressed air or dry ice pellets introduced into the well will achieve the desired result.

After dosage, the well should stand for several hours or overnight under chlorination. It may then be pumped until a representative raw water sample is obtained. Bacterial examination of the water will indicate whether further treatment is necessary. If one treatment does not produce the required results, the procedure must be repeated until satisfactory bacterial results are procured over a period of several days.

PEAK DEMANDS

Problem

In communities that have grown rapidly, where seasonal population is a factor or where heavy demands are made on the water supply at certain periods of the day, the problem of peak-chlorinating demands exhausting the capacity of the chlorinating equipment is an ever present danger.

Treatment

Where budgets do not permit the replacement of existing equipment, or where peak load demands are not of sufficient duration and frequency to warrant such replacement, hypochlorination offers a flexible method of increasing chlorination capacity.

The method of feeding will vary with the frequency and duration of the peak loads. At plants where the peak load demands exceed chlorinator capacity infrequently and for short periods of time, simple gravity feed methods can be used successfully. Where, on the other hand, a recurring need for supplementary chlorination is present, a method of injecting hypochlorite solutions near the regular chlorination point offers the operator many advantages. Among these are (a) reliability, (b) low up-keep, and (c) relatively small initial investment.

CLEANING AND SANITIZING EXISTING EQUIPMENT

Problem

Mixing tanks, settling basins, mains, etc., require periodic cleaning to remove sludge, sediment, calcium deposits and algae growths. Such equipment should be thoroughly treated with HTH® Dry Chlorinator solutions before being placed back in service.

Treatment

After removing equipment from service, free it of sediment and deposits and thoroughly clean equipment surfaces of all physical soil.

Tanks, basins and other equipment holding water may be sanitized by placing dry calcium hypochlorite near the influent at the rate of 780 grams HTH® Dry Chlorinator for each 1 cubic meter or 4 oz. for each 5 cubic feet capacity (approximately 500 ppm). Fill to working capacity and allow to stand under chlorination for a period of at least 4 hours. Drain to waste and place in service.

In those installations where the above treatment is not practical, another method may be used. After thorough cleansing, the equipment surfaces may be generously sprayed or swabbed with HTH Dry Chlorinator solution containing 30 grams of HTH Dry Chlorinator for each 20 liters or 1 oz. for each 5 gallons of water (approximately 1,000 ppm). After drying, the equipment should be

completely flushed down with potable water before it is returned to service.

EMERGENCY NEEDS

FLOODS

The water plant's operations make it particularly vulnerable to the effects of flood waters. In recent years, the spectre of disease and pestilence following in the wake of flood disaster has been sharply reduced. This has been to a great extent the result of foresight on the part of those responsible for the operation of the water supply system who have provided adequate portable hypochlorination facilities and stocks of HTH® Dry Chlorinator commensurate with local flood histories. Unfortunately, such precautions have not yet been taken in all places. Where such safety procedures have been delayed, the water works superintendent should take immediate steps to protect the area he serves.

It is not possible, of course, to anticipate the degree or manner which flood waters may disrupt or contaminate the individual water purification or distribution system. Listed below, however, are some of the more common problems which arise along with specific treatments which have proven effective in the past.

Wells

PROBLEM

The pollution of wells by flood waters can result from seepage, broken casings or contamination of the underground stream through open or abandoned underground stream through open or abandoned wells. An immediate bacteriological examination of samples from any well subjected to flood conditions is advisable.

TREATMENT

1. Where surface contamination has gained an entry, the well casing should be thoroughly flushed down with a concentrated hypochlorite solution containing about 30 grams of HTH® Dry Chlorinator for each 40 liters or 1 oz. for each 10 gallons of water (approximately 500 ppm).
2. Where silt and mud have entered the well and reduced the yield by penetrating the sand or gravel strata, backwashing will restore the well's yield and also help to remove the elements which cause turbidity. It is recommended that an *HTH Dry Chlorinator sol*ution be introduced into the backwashing stream in sufficient quantity to produce a dosage of approximately 10 ppm.
3. After the casing has been treated and the well cleared of all turbidity, sufficient HTH Dry Chlorinator solution should be injected into the well either by pumping or gravity to give a residual of not less than 50 ppm after thorough mixing by agitation. Where agitation is not provided by pump pressure, the introduction of compressed air line or (where this is impractical) dry ice pellets is usually sufficient to allow complete mixing.
4. Permit the well to stand under chlorination for several hours, then pump the contents to waste until a representative raw water sample can be obtained for bacteriological examination.
5. If the results of bacteriological examination are not acceptable, it is necessary to repeat the treatment until reduction of the contamination is indicated by satisfactory bacteriological results over a period of several days.

Reservoirs

PROBLEM

Those reservoirs which store filtered or purified water are especially susceptible to contamination by overflowing streams and surface waters.

TREATMENT

Contamination can be materially reduced by establishing emergency hypochlorination stations on small streams which overflow into the reservoir. This can be done by the mechanical feed or gravity feed methods at a point sufficiently distant from the place of entry into the reservoir so that the desired available chlorine residual may be obtained several minutes after chlorination.

Where storage reservoirs are heavily contaminated by surface drainage or flood waters, it is advisable to apply HTH® Dry Chlorinator solution or dry HTH Dry Chlorinator to the reservoir itself in sufficient quantity to produce a chlorine residual (0.2 ppm) in all parts of the reservoir.

Basins, Tanks, Flumes, etc.

PROBLEM

Flood waters often cause damage to plant equipment. Once repaired, it must be thoroughly cleaned and decontaminated before it is returned to service.

TREATMENT

Basins, tanks, and other equipment which operate with established water levels should first be completely freed of all grease, oil and sediment. This sometimes can be done by high pressure hosing, although thorough

scrubbing is often necessary. After all physical soil is removed, dry HTH® Dry Chlorinator should be introduced to the bottom of the equipment at the rate of 780 grams for each 1 cubic meter or 4 oz. for each 5 cubic feet of water (approximately 500 ppm) when at working level. The turbulence of the incoming waters will ensure thorough mixing. If possible, permit the equipment to remain under chlorination for 24 hours, and in no case less than 4 hours. Then drain, flush and return to service.

Where the above method is not suitable for the decontamination of flumes, basins, tanks, etc., the spraying or flushing of the equipment with a solution containing 30 grams HTH Dry Chlorinator for each 20 liters or 1 oz. for each 5 gallons of water is recommended (approximately 1,000 ppm). Best results may be obtained by allowing equipment to stand 2 to 4 hours after spraying. It may then be flushed and returned to service.

Filters

PROBLEM

Flood damage to filter beds may range anywhere from simple contamination by polluted waters to encrustation with mud and silt to a point where the filter sands must be replaced.

TREATMENT

Where filter sands require replacing, the even distribution of dry HTH® Dry Chlorinator throughout the new sand is recommended. The approximate rate is 450 grams HTH Dry Chlorinator for each 5 cubic meters or 1 lb. for each 150 - 200 cu. ft. of sand. Where filter beds are severely contaminated, it is further suggested that additional hypochlorite be distributed over the sand's surface after it is in place at the rate of approximately 240 grams HTH Dry Chlorinator for each 1 square meter or 1 lb. for each 20 sq. ft. of filter surface. The water initially admitted to the filter bed should be permitted to stand for a period of 4 to 24 hours at a height of 2.5 cm (1 inch) above the top of the filter sand.

In cases where filter beds can be cleared of mud and silt by ordinary backwashing, it is recommended that this procedure be supplemented by applying HTH Dry Chlorinator in the following manner for disinfection purposes:

1. Distribute dry HTH Dry Chlorinator over the surface of the filter bed at a rate of 100 grams for each 1 square meter or 1 lb. for each 50 sq. ft. of filter surface, allowing the water to stand at a depth of about 30 cm (1 foot) above the filter sand.
2. Allow 30 minutes for HTH Dry Chlorinator solution to dissolve and disperse, then drop level of water to the level of the filter sand top.
3. After 4 to 6 hours under chlorination, drain to waste through the bottom of the filter bed and proceed with normal backwashing technique. Filter may then be returned to service if found physically clean.

Distribution System

PROBLEM

Washouts and main breaks are common occurrences resulting from flood conditions. The distribution system, therefore, should be carefully inspected for broken mains before being placed back in service to prevent the possibility of contamination spreading throughout the entire system.

TREATMENT

1. After broken mains are repaired or replaced, the entire section of the distribution system exposed to contamination should be thoroughly flushed by consecutive drainage of fire hydrants from the high pressure to the low pressure end.
2. Suitable sampling stations (other than fire hydrants) should be set up at selected points for obtaining bacterial and chlorine residual samples.
3. After the contaminated section has been put under pressure, introduce HTH Dry Chlorinator solution by means of a pump or hypochlorinator. A sampling station should be opened on the low pressure end of the section and drained until a consistent dosage of at least 10 ppm is indicated in the discharge by test, after a 24 hour retention time. This may usually be expected with an application of 25 ppm of available chlorine.
4. If the residual drops below 10 ppm apply additional dosage and repeat above steps. If proper residual is maintained, however, contaminated section may be flushed progressively at each hydrant from the high pressure to the low pressure end.
5. Daily bacteriological samples should conform closely with raw water supply samples in coliform count for a period of at least 5 days. If this does not happen, the sanitization process must be repeated until satisfactory samples are obtained.

FIRES

Emergency needs of fire fighting equipment are occasionally apt to impose a pumping demand on the water supply system which exceeds the capacity of the chlorination equipment. Also, where pumping capacity

or water storage capacity is limited, fire fighting needs may compel the use of cross connections to untreated supplies to provide sufficient water to meet the emergency.

Chlorination Capacity Exceeded

PROBLEM

It is not uncommon for storage and pumping facilities in the water distribution system to exceed chlorination capacities, especially where the fire department must depend solely on the water system to meet heavy fire fighting requirements.

TREATMENT

When chlorine residual tests or other means indicate that pumping for fire fighting purposes has exceeded the capacity of the existing chlorination equipment, one of several courses must be immediately followed to prevent entry of untreated water into the distribution system.

1. Where emergency hypochlorination equipment is maintained, it should be put into operation immediately, feeding an HTH® Dry Chlorinator solution of sufficient strength to maintain the chlorine residual in the distribution system at normal levels, 0.2 ppm. It is preferable to set up the hypochlorite injection point ahead of the regular chlorination equipment and to add sufficient HTH Dry Chlorinator solution with hypochlorinator to permit the regular equipment to operate at below its full capacity. This will allow a margin for variation to meet increasing or decreasing demands.
2. Where mechanical feeding is not possible, the gravity feed method may be used. This can be done by selecting the most practical point and then feeding an HTH Dry Chlorinator solution directly into the water at a constant rate. It is preferable to introduce the gravity feed at a location above the regular chlorination equipment so that the flexibility of the latter can be used to maintain the required chlorine residuals.
3. On occasion, there is neither sufficient time nor equipment available to utilize either gravity or mechanical hypochlorination. In such circumstances, it is possible to maintain chlorine residuals by feeding dry hypochlorite at a convenient point as far as possible above the regular pumping and chlorination equipment. Dry granular calcium hypochlorite may be successfully fed under emergency conditions by hand or by other dry feeding methods. Whatever procedure is chosen, however, it is important to remember that dry feeding must be conducted at a point well in advance of the pumping equipment to ensure proper dissolving and thorough mixing. Also, it should be attempted only where a considerable flow of water exists.

Cross Connections or Emergency Connections

PROBLEM

Where pumping or storage capacity facilities are limited, thereby requiring the need for cross connections between untreated or polluted streams and the potable water distribution system; or where no connections exist but it is necessary to use emergency pumps to supplement the standard water supply - it is essential that immediate provisions be taken to treat any raw water so that the possibility of contaminating the distribution system is minimized.

TREATMENT

Emergency hypochlorination equipment or a simple gravity feed may be set up near the intake of the untreated water supply so that sufficient HTH Dry Chlorinator solution may be introduced to give a chlorine residual of at least 0.2 ppm at the point where the untreated supply enters the regular distribution system.

Because normal consumer and household demands continue during fire-fighting, it is advisable to dose untreated supplies at a rate in excess of the usual dosage to prevent contaminating the distribution system and insure against the possibility of polluted water being withdrawn by consumers. Chlorination practices and dosages should conform with local regulations.

DROUGHTS

Supplementary Water Supplies

PROBLEM

When the usual sources of raw water fail or fall below normal demands due to drought, it is often necessary to lay emergency lines to less desirable sources to supplement available supplies.

TREATMENT

Existing chlorinating equipment is seldom sufficient to accommodate supplementary supplies. This is due to the higher pollution or to the location of the supplementary water supply so distant as to preclude treatment by the existing installation before entry into the distribution or storage system.

Emergency HTH® Dry Chlorinator feeding equipment can very often be utilized to solve the above problem. Gravity or mechanical hypochlorite feeders should be set up at the most appropriate point on the supplementary

line and then adjusted to dose supplementary water entering the system to a minimum residual of 0.2 ppm after a contact of 20 minutes.

Where it is necessary only to supplement the existing chlorinating equipment, the hypochlorite feed should, if possible, be set up well above existing equipment in the direction of flow and operated at a constant rate to allow permanent equipment latitude to take care of demand variations.

Extreme Conditions

PROBLEM

Where drought has completely paralyzed the water system so that trucking or shipping of potable water to stricken communities is necessary, the entire disinfection of the shipped water, the protection against contamination during shipment and the assurance of safe hauling and handling becomes a problem.

TREATMENT

Tanks, tank cars, tank trucks, hoses filling and discharge equipment should all be thoroughly scrubbed and cleaned before being utilized. Immediately before the shipping container is filled at the loading point, all surfaces which may come into contact with the potable water should be sprayed, flushed or swabbed with a solution containing 30 grams HTH® Dry Chlorinator for each 20 liters or 1 oz. for each 5 gallons of water (about 500 ppm). The container should be permitted to stand for ten minutes to ensure complete action. It may then be rinsed thoroughly with treated potable water to remove any remnants of excess hypochlorite which may be present. After or during the filling operation, the water should be dosed with enough HTH Dry Chlorinator solution to provide a residual of at least 0.2 ppm upon arrival at the distribution point.

MAIN BREAKS

PROBLEM

Broken water mains may cause contamination of a large section of the adjoining main or may contaminate the entire system, depending on the nature and location of the break.

TREATMENT

Before assembling the repaired main section, careful flushing out of any mud and silt which may have entered at the breakage point should be accomplished. Heed must also be given that no mud or trench water be permitted to enter mains where new sections are laid. Jute or textile packings for making main joints tight have been found difficult to sanitize. Rubber and other more easily disinfected joint packings are preferred.

After assembly, any portion of the distribution system which may have become contaminated should be disinfected in the manner described above under New Mains.

POWER FAILURES

PROBLEM

Loss of pumping power at the water treatment plant results in the inability to chlorinate with existing equipment.

TREATMENT

At installations where loss of power affects chlorination equipment but where gravity feed still allows sufficient pressure for delivery of water to consuming points, mechanical or gravity HTH® Dry Chlorinator solution feeders may be set up at a convenient location on the gravity line to provide a normal chlorine residual in the distribution system. Where power losses may occur frequently, it is good practice to provide a portable petrol-driven hypochlorinator to meet such contingencies.

In cases where power losses may result in a complete paralysis of the distribution system, it may be found necessary to distribute potable water by truck or by hand. Under such circumstances all water distributed should be dosed with HTH Dry Chlorinator solution to attain a chlorine residual sufficiently high to completely disinfect the water supply and to adequately protect it against recontamination while in transit. A chlorine residual of 0.2 ppm is a minimum where such extreme conditions exist.

CHLORINATING EQUIPMENT FAILURES

PROBLEM

Stand-by gas chlorinators are expensive and, therefore, not every water plant can afford to possess one. Failure of the existing chlorinating equipment to function properly leaves the plant without adequate facilities to protect the water supply.

TREATMENT

Those plants which do not have stand-by gas chlorinating equipment should provide themselves with portable hypochlorinating equipment of sufficient capacity to serve emergency needs. While the failure of modern, well-designed chlorinating equipment is rare, worthwhile protection is afforded by acquiring a portable hypo-chlorinator, enabling the plant personnel to apply

chlorination promptly and efficiently when needed at any point in the treatment or distribution system.

Where mechanical hypochlorinators are available, they should immediately be placed in the operation at a convenient point to permit adequate mixing of the solution with the entire volume of water to be treated.

If no hypochlorinator is available, a gravity feed should be set up at the most practical point and then adjusted to feed hypochlorite solution into the water supply in a manner calculated to maintain minimum normal dosage under maximum demand conditions. Where demands or pumping fluctuate widely, it will be necessary to place such gravity feeders under careful supervision to ensure the same dosage at all times.

MUNICIPAL WASTEWATER

EFFLUENT DISINFECTION

HTH® Dry Chlorinator can destroy disease-producing organisms in raw or treated sewage. Therefore, it is often used as a standby treatment in large sewage systems and as a primary treatment in smaller ones.

Chlorination for disinfection must take place before the sewage reaches a septic state. (Sewage becomes septic when its oxygen is lost through decomposition and its sulfates are reduced to hydrogen sulfide.) Since chlorination usually takes 15-30 minutes, a suitable detention basin must be provided.

If hypochlorinators are being used, they should always be located near the influent of the detention basin. If mechanical stirring or other agitators are not being used, chlorination for disinfection should take place before any primary or secondary sedimentation treatments.

The amount of HTH® Dry Chlorinator solution required will vary, depending on the concentration and condition of the final effluent. About 30% of the chlorine demand of raw sewage is attributable to settled solids, 40% to suspended and colloidal solids; 30% to dissolved solids.

Disinfection should be controlled by laboratory methods, where possible. In general, use sufficient HTH Dry Chlorinator to provide a chlorine residual of 0.6 to 1.0 ppm after 15-30 minutes of contact. Experience with different types of sewage will usually establish a relationship between residual chlorine and contact time. This relationship can then become the controlling factor for the operation, with occasional bacteriological checks being made as a safeguard.

When sewage is to be temporarily disinfected before being diluted in a body of water, the following dosages will usually provide satisfactory protection against pollution of the receiving waters:

Raw sewage requires from 10-30 ppm available chlorine.

Primary treated sewage requires 4-20 ppm available chlorine.

Primary and secondary treated sewage requires 2-5 ppm available chlorine.

Bacteriological tests should be made frequently.

HYDROGEN SULFIDE GENERATION CONTROL

Decomposing septic sewage generates hydrogen sulfide, which not only causes an odor problem, but oxidizes into sulfuric acid and causes disintegration of the masonry in the damp area above the water line.

Decomposition can be held in check by "up sewer hypochlorination" using HTH® Dry Chlorinator solution in sufficient quantity to yield 15 ppm available chlorine. HTH Dry Chlorinator solution should be introduced at points throughout the sewer trunk system so that all sewage is treated before it has reached a septic condition. Where sewage has already become septic, a stronger dosage of HTH Dry Chlorinator will be needed. This method of treatment is especially valuable in sluggish collection systems or long outfalls.

SLIME CONTROL

In sewer systems and treatment plants, uncontrolled slime can clog conduits, infest trickling filters, restrict water ways and cause ponding of the filters and sludge bulking.

For slime control in conduits, the chlorination dose must be determined by the chlorine demand of the system. Chlorination in concentrations of 2-15 ppm available chlorine, based on the system's chlorine demand, will control the growth of slime. (These concentrations are equivalent to 100-1000 ppm on the basis of dry solids in the effluent at the point of infection.)

The solution of HTH® Dry Chlorinator must be applied at a point where it will mix thoroughly with the effluent. The application should be repeated as required. Once the infestation has been reduced to an acceptable level, the growth may be controlled by a continuous dose of 0.5 ppm available chlorine.

When ponding of the filters is excessive, filter nozzles often become clogged. Solution of HTH Dry Chlorinator, fed continuously into the effluent from above the filter nozzles, will clean the filters properly. In extreme cases, HTH Dry Chlorinator solutions containing 15 ppm

available chlorine will be necessary. After a thorough cleaning, the filters may be kept slime-free by either of two methods: (1) a continuous dose of 0.1 ppm available chlorine; or (2) intermittent application of HTH Dry Chlorinator solution to the dosing tanks. The necessary dosage and frequency of application depend on the severity of the problem.

In activated sludge plants, slime can interfere with proper settling, causing "bulking sludge." HTH Dry Chlorinator solutions containing 2 to 8 ppm available chlorine, introduced into the return sludge line, will effectively control this problem.

B.O.D. REDUCTION

The discharge of sewage with a high biochemical oxygen demand (B.O.D.) into lakes and streams can cause odors, visual pollution and death to aquatic life.

This condition can usually be avoided by applying HTH® Dry Chlorinator solution to the effluent until a substantial residual is obtained. Application should be made at a point which will permit a 10-20 minute contact period before the discharge of the effluent into the stream. Minimum dosage to a residual of about 0.2 ppm after a contact time of at least 10 minutes will reduce the effluent's B.O.D. 10-30%. Where longer-lasting or greater B.O.D. reductions are necessary, increased chlorine residuals are recommended.

RELATED INFORMATION

HTH® Dry Chlorinator -- Product Data Bulletin AD 6158-297

HTH® Dry Chlorinator for Use in: Industrial Cooling and Wastewater HTHADS97-5

HTH® Dry Chlorinator for Use in: Private Water Supplies HTHADS97-8

Please refer to the Material Safety Data Sheet (MSDS) for complete information on Storage and Handling, Toxicological Properties, Personal Protection, First Aid, Spill and Leak Procedures, and Waste Disposal. To order an MSDS, call your Olin sales office. Review the MSDS thoroughly before handling product.