HTH® DRY CHLORINATOR

HTH® dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

HTH dry chlorinator meets the American Water Works Association Standards for hypochlorites (AWWA B300-80) for use in the treatment of municipal and industrial water supplies. It is also listed by AWWA for use in disinfecting water mains and water storage facilities. (AWWA C601-80 and D105-80.)

HTH also meets Federal Specification O-C-11-114B for calcium hypochlorite used in military applications. HTH dry chlorinator has been registered with the Environmental Protection Agency (EPA) for use in a variety of industrial applications, mostly to sanitize equipment and/or water supplies. If you are interested in an application for HTH which is not currently registered with the EPA, contact your nearest Olin Sales Office.

Solubility and Concentration

HTH® dry chlorinator (granular) will dissolve rapidly in agitated water. Figure 1 shows rate of dissolution.

The concentration of an HTH solution may be determined by volumetric titration. The pH and specific gravity of HTH solutions vary with the concentration of HTH (see Figures 2 and 3).

Table 1
Specifications

	Granular	Tablet
Available Chlorine, $Ca(OCl)_2$ (% by weight, min)	65	65
Water, hydrate (%)	5.5-8.5	4.0-8.5
Iron (%, max)	0.05	0.05
Oxides, heavy metals and Al (%, max)	0.5	0.5
Inorganic Salts (%)	26.0-29.0	26.0-30.5

Table 2
Typical Physical Properties

	Granular	Tablet
Molecular Weight	142.99	142.99
Bulk Density, loose (lb/ft³)	50	74
Particle Size, U.S. Standard Screen (%, max)		
on 10 mesh	0.5	—
on 14 mesh	15.0	—
thru 100 mesh	3.0	—
Weight (g)	—	7
Length (in)	—	0.75
Thickness (in)	—	0.44

Figure 1
Rate of Dissolution of HTH® Dry Chlorinator (Granular)

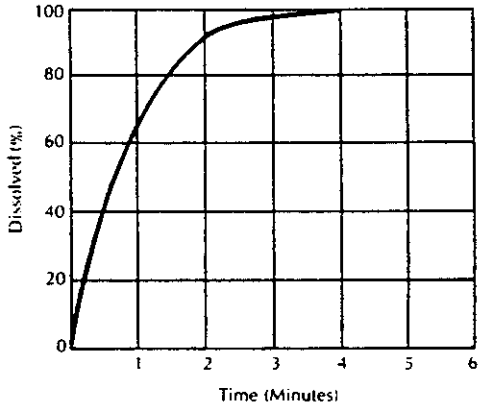
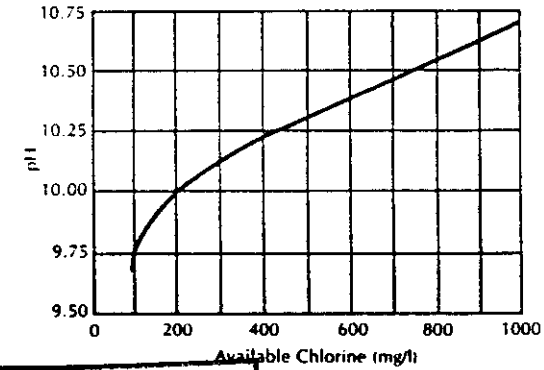


Figure 2
pH vs Strength of $Ca(OCl)_2$ Solutions



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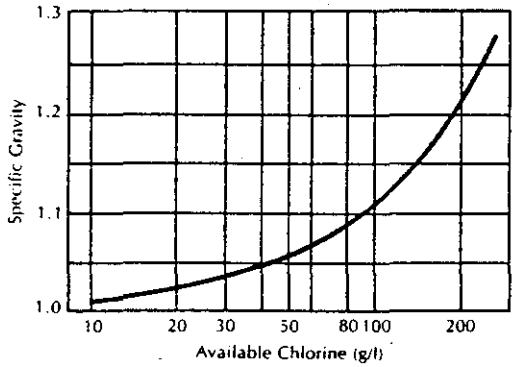
HTH® DRY CHLORINATOR

Figure 3
Specific Gravities of $Ca(OCl)_2$ Solutions



Storage and Handling

Store in cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign material. Protect against physical damage. Drums may rupture if exposed to heat.

Toxicological Properties

The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and is not known to be a carcinogen.

Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, rubber or PVC gloves and boots. Read label instructions before using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Spill and Leak Procedures

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use (see Title 29, Section 1910.134, *Code of Federal Regulations*). Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. Wash all contaminated clothing before reuse. In the event of a large spill call 203-356-2345.

Disposal

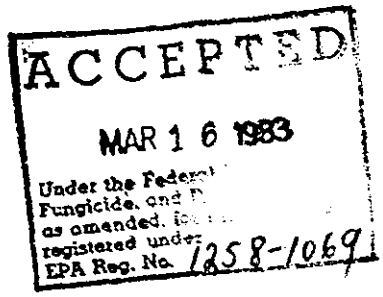
Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regulatory agencies to ascertain proper disposal procedures.

Shipping Information

HTH® dry chlorinator is available in granular or tablet form in 100 lb. fiber drums.

Technical Assistance

Technical assistance is available to facilitate further investigation of HTH® dry chlorinator. If you have a question or need more information, please call or write your nearest Olin Sales Office.



Keep HTH® out of reach of children. Danger. See principal label for complete precautionary information and storage and handling.

This bulletin and the information contained herein are offered solely for your consideration, investigation and verification. No representations or warranties, express or implied, of merchantability or otherwise, are made or contained herein. Olin's responsibility for any claims arising in connection herewith shall in no event exceed the purchase price or fair market value of the material. User may be responsible for compliance with all applicable Federal, state and local laws and regulations regarding the product and its storage and handling. Nothing contained herein shall be construed to constitute permission or a recommendation to practice any invention covered by a patent or patent application or know-how owned by Olin Corporation or by others.

The use of HTH® dry chlorinator for the purposes described in this bulletin has been registered with the United States Environmental Protection Agency, but may not have been approved or registered for use or sale for such purposes in other countries. Olin Corporation assumes no responsibility for compliance with the laws of any country except the United States.

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STORAGE AND HANDLING OF HTH® DRY CHLORINATOR

HTH® dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

When it is stored and handled properly, HTH dry chlorinator is a stable chemical. But it is an oxidizing agent and is highly corrosive.

HTH dry chlorinator is not flammable, but in the presence of contaminants it may react violently, generating heat and zardous gases, and possibly causing an intense fire and/or losion. It is important for everyone who handles Olin calum hypochlorite products to be fully aware of the proper handling and storage procedures.

In case of an accident, it's also necessary to be aware of the appropriate emergency and first-aid procedures.

Stability

Heat Stability: At temperatures above 177°C (350°F), HTH® dry chlorinator will decompose rapidly. Decomposition will result in the evolution of oxygen and heat and the chances of a serious fire will be increased. If decomposition occurs in a closed container, enough pressure may develop to blow off the lid or rupture the container.

Temperatures exceeding 52°C (125°F) sustained over four or five days may also cause decomposition of HTH dry chlorinator.

Direct exposure to flame will cause decomposition, container eruption and the increased possibility of an intense fire.

Chemical Stability: When stored in a clean, dry, sealed ntainer and not exposed to heat, HTH dry chlorinator is emically stable. But because it is a powerful oxidizer, contamination may start a chemical reaction. This would cause rapid decomposition, fuming and the evolution of oxygen and heat. An explosion, container eruption and/or fire of great intensity might also occur.

Storage

Containers of HTH® dry chlorinator should always be stored in a cool, dry, well-ventilated place. For safekeeping, be sure to follow all the storage recommendations listed here:

- Do not store in sealed, unventilated warehouses or storage sheds where temperature could exceed 57°C (135° F) for prolonged periods.
- Store in an area where the water supply is easily accessible, preferably one with a sprinkler or fire suppression system.
- Storage area should be provided with the means of venting fumes during fire emergency.
- *Do not store in an area subject to flooding.*
- Store on pallets to prevent possible water damage.
- Store containers in an upright position.
- Store separately from materials that react with calcium hypochlorite products, such as acids, propellants, explosives, solvents, pesticides, agricultural products, pool chemicals, paint products, household products, oils, vinegar, pine oil, beverages, soaps and detergents.
- Do not store near products labeled corrosive, flammable or combustible.
- Avoid contact with any foreign material, rags, garbage and dirt.
- Keep HTH dry chlorinator away from open flames, lighted cigarettes and other burning materials.
- Never allow aisles to become blocked.

To separate HTH dry chlorinator from other materials it may react with, place inert materials between them, store them on the other side of a wall or partition, or in a separate building.

The Olin safety poster should be displayed in the storage area to remind employees to follow these important rules for storing HTH dry chlorinator. The poster is available from your nearest Olin sales office.

How to Stack Containers

Containers of HTH® dry chlorinator should be stacked on standard double-faced pallets which are clean and free of any oil or other combustible substance.

To keep containers off the floor, place the bottom layer on a pallet. If the second or third layers are not palletized, use plywood or some other suitable material between layers.

The following recommendations give specific instructions on loading and stacking pallets for the various types and sizes of containers.

For 75-lb and 100-lb drums, use 40- x 48-inch pallets:

- 8 drums per layer
- 2 layers per pallet
- 3 pallets high

For 50-lb drums, 50-lb pails and 35-lb pails use 40- x 48-inch pallets:

- 12 drums per layer
- 2 layers per pallet
- 3 pallets high

For 25-lb pails, use 40- x 48-inch pallets:

- 12 pails per layer
- 3 layers per pallet
- 3 pallets high

For 5.5-lb and 6-lb bottles, 9 per carton; and 9-lb bottles, 6 per carton; use 40- x 48-inch pallets.

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STORAGE AND HANDLING OF HTH® DRY CHLORINATOR

- 9 cartons per layer
- 3 layers per pallet
- 2 pallets high

Handling

Follow these rules when handling unopened containers of HTH® dry chlorinator:

- Keep containers upright.
- Do not drop, roll or skid containers.
- Rotate stock on a first in, first out basis.
- Do not smoke while handling.

If products must be handled directly from an open container, read instructions and precautionary information on the label and follow these additional precautions:

- Read the use instructions and the precautionary information on the label before handling.
- Wear goggles or a face mask, neoprene gloves and protective clothing while handling.
- Do not breathe dust and fumes.
- Do not allow contact with skin, eyes or clothing.
- Do not swallow.
- Use only a clean, dry container to measure or carry.
- Mix only into water. Never mix with any other chemical.
- Always replace lid to avoid contamination.
- Never return spilled material to original containers.
- Do not repack.
- Wash empty containers with large amounts of water and discard.
- Remove and wash contaminated clothing promptly.

Toxicological Properties

HTH® dry chlorinator is corrosive to the skin and eyes. It can cause chemical burns to people and animals which come in direct contact with it. If swallowed, it may be fatal. HTH dry chlorinator is also toxic to fish, so be careful not to contaminate lakes, ponds or streams with it.

HTH dry chlorinator was not found to be a mutagen in the Ames assay and is not known to be a carcinogen. The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat).

First Aid

If HTH® dry chlorinator touches the skin, brush off the excess material and flush the skin with water for at least 15 minutes. If irritation persists, call a physician.

If HTH dry chlorinator is inhaled, get fresh air as soon as possible. Get immediate medical attention.

If HTH dry chlorinator gets into the eyes, flush with water for at least 15 minutes. Call a physician.

If HTH dry chlorinator is swallowed, give bread soaked in milk followed by large amounts of water. If the victim remains conscious and is vomiting, place face down with head lower than hips. Call a physician immediately.

Emergency Procedures

Spill and Leak Procedures: Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use. (See Title, 29, Section 1910.134 *Code of Federal Regulations.*) Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to prevent contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well-ventilated area. Do not seal the container. Flush any residual material with large quantities of water.

Contaminated Material: Damaged containers and those holding contaminated material should not be resealed. If possible, isolate such containers in an open, well-ventilated place. Do not allow smoking while handling. Do not place containers near open flames.

For specific information on handling or disposing of large quantities of spilled material or damaged containers, call the Olin Product Emergency Service (OPES) 24-hour emergency telephone number: 203-356-2345.

Fire: In the event of a fire, protect containers of HTH® dry chlorinator by cooling with large quantities of water.

When multiple packages of HTH dry chlorinator are involved, evacuate the area immediately. In this potentially explosive situation, the fire should be fought from a distance by experienced firefighters.

Disposal

Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regulatory agencies to ascertain proper disposal procedures.

Packaging Information

HTH® dry chlorinator, in its granular form, is available in 50-lb, 75-lb, and 100-lb fiber drums; 25-lb and 35-lb plastic pails; and, 9-lb and 5.5-lb polyethylene bottles.

In its tablet form, HTH dry chlorinator is available in 75-lb and 100-lb fiber drums; 25-lb, 35-lb and 50-lb plastic pails; and 6-lb polyethylene bottles.

Technical Assistance

Technical assistance is available to facilitate further investigation of HTH® dry chlorinator. If you have a question or need more information, please call or write your nearest Olin Sales Office.

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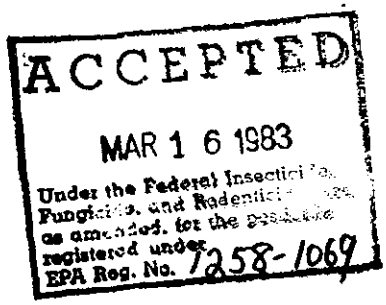

Keep HTH® out of reach of children. Danger. See principal label for complete precautionary information and storage and handling.

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HTH® DRY CHLORINATOR FOR SANITIZATION OF FRUITS AND VEGETABLES

Sanitization with HTH® dry chlorinator is an easy and effective way to control harmful bacteria and fungi that often contaminate fruits and vegetables. It protects crops from diseases like soft rot and blotch, during growth and after harvesting. And it improves the keeping qualities of fruit.

Advantages of HTH® Dry Chlorinator

HTH dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

All commercial sanitizers sold for biocidal applications must be registered with the Environmental Protection Agency (EPA). Olin has produced HTH dry chlorinator for over 50 years and has obtained registration for many of these applications. Some of them are presented here, but if your specific needs are not included contact your nearest Olin Sales Office. Additional data are on file or we may be able to help you obtain the necessary registration.

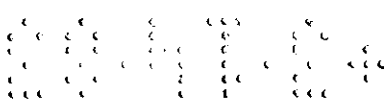
How to Use Solutions of HTH® Dry Chlorinator For Sanitization

Growing Mushrooms: Solutions of HTH dry chlorinator containing 100-200 ppm available chlorine help control bacterial blotch *(Pseudomonas toloasii)*. The first application to the production surface should begin when pins form. Thereafter, apply the solution to the surface between breaks as needed, depending on the occurrence of bacterial blotch.

HTH may also be used directly for local applications to control concentrations of the disease. Apply 1½ to 2 oz. (40-60 g) dry weight per square foot of growing space.

Picked Fruits: Solutions of HTH containing 25 ppm available chlorine can reduce harmful bacterial accumulations and improve the keeping properties of fruit. Soak the fruit for two minutes in the solution, then rinse with potable water.

Picked Vegetables: HTH solutions containing 25 ppm available chlorine can be used for disinfection. First, remove surface soil and debris in a wash tank. After draining, disinfect by submerging in a second wash tank for two minutes while circulating the chlorinated wash water. After this washing, spray rinse with fresh HTH solution, rinse with potable water and then package.



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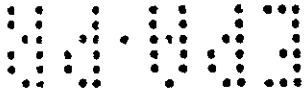

Harvested Potatoes: HTH solutions containing 500 ppm available chlorine help control and reduce the spread of organisms which cause soft rot. Spray one gallon of this solution over each ton of unwashed tubers as they enter storage on a conveyor line. Provide tumbling action during this treatment.

Harvested Sweet Potatoes: HTH solutions containing 150-500 ppm available chlorine help control and reduce the spread of organisms which cause soft rot. The sweet potatoes should be sprayed with the solution, or dipped, for 2-5 minutes. If a dip is used, monitor the solution hourly and add HTH dry chlorinator to maintain the recommended chlorine level. Or, change the solution hourly (or as frequently as necessary) to prevent the available chlorine level from dropping too low.

How to Prepare Solutions of HTH® Dry Chlorinator[a]

Each of the applications listed above requires a specific concentration of solution, measured in parts per million (ppm) of available chlorine. To prepare the proper strength solution follow these three simple steps:

1. Determine the volume[b] of the holding tank (in cubic feet or cubic inches).
2. Find the capacity of the tank in gallons. If the volume has been determined in cubic feet, use Formula (1). If the volume is in cubic inches, use Formula (2).
   (1) Gallons = 7.48 x Volume in cubic feet
   (2) Gallons = .0043 x Volume in cubic inches
3. Use Table 1 to determine how many ounces of HTH dry chlorinator must be added to the number of gallons of water to obtain the required ppm of available chlorine. (Never add HTH dry chlorinator to anything but water.) For a volume of water that does not appear in Table 1, simply calculate between values.

Storage and Handling

Store in cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign material. Protect against physical damage. Drums may rupture if exposed to heat.

Toxicological Properties

The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and *is not known to be a carcinogen.*

[a]Stock solutions should be freshly prepared and kept in properly labeled containers to protect against contamination. Unused stock solut... should be discarded.

[b]Volume of a rectangular tank:
V = Length x Width x Height
Volume of a circular tank:
V = 3.142 x Radius x Radius x Height[4]
or
V = 0.785 x Diameter x Diameter x Heig...

HTH® DRY CHLORINATOR FOR FRUITS AND VEGETABLES

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Table 1
Required Amounts of HTH® Dry Chlorinator*
(Pounds-Ounces)

Available Chlorine (ppm)	Water (Gallons)				
	10	50	100	500	1,000
25		0-¼	0-½	0-2½	0-6
50	0-⅒	0-½	0-1	0-5¼	0-11½
100	0-⅗	0-1	0-2	0-11	1-5
150	0-⅒	0-1½	0-3	1-0	2-0
200	0-⅘	0-2	0-4	1-5	2-10
500	0-1	0-6	0-11	3-4	6-8

*For convenience in measuring small quantities, 2 teaspoons of granular HTH equals approximately ¼ ounce.

Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, rubber or PVC gloves and boots. Read label instructions before using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Spill and Leak Procedures

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use (see Title 29, Section 1910.134, *Code of Federal Regulations*). Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. Wash all contaminated clothing before reuse. In the event of a large spill call 203-356-2345.

Disposal

Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regulatory agencies to ascertain proper disposal procedures.

Shipping Information

HTH® dry chlorinator is available in granular or tablet form in 100 lb. fiber drums.

Technical Assistance

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Sales Offices

Atlanta, GA 30328–1140 Hammond Dr., Suite 6150, (404) 394-5820
Deerfield Beach, FL 33441–700 W. Hillsboro Blvd., Suite 203, (305) 426-0101
Charlotte, NC 28280–1 NCNB Plaza, Suite 3505, (704) 373-1681
Cincinnati, OH 45242–8150 Corporate Park Dr., Suite 210, (513) 489-7990
Houston, TX 77027–4550 Post Oak Place Dr., Suite 221, (713) 960-0610
Oak Brook, IL 60521–2301 W. 22nd St., Suite 209, (312) 325-2280
Orange, CA 92668–500 S. Main St., Suite 910, No. Tower, (714) 558-9101
St. Louis, MO 63105–7777 Bonhomme Ave., Suite 1908, (314) 862-6705
Stamford, CT 06901–3 Landmark Square, Suite 205, (203) 356-3000
Wayne, PA 19087–997 Old Eagle School Rd., Suite 208, (215) 293-0990
International Sales–120 Long Ridge Rd., Stamford, CT 06904, (203) 356-2000

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HTH® DRY CHLORINATOR FOR SANITIZATION OF MARINE ENVIRONMENTS

Sanitization with HTH® dry chlorinator is an easy and effective way to destroy harmful bacteria and algae in fish ponds, hatcheries and other marine environments.

Advantages of HTH® Dry Chlorinator

HTH dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

All commercial sanitizers sold for biocidal applications must be registered with the Environmental Protection Agency (EPA). Olin has produced HTH dry chlorinator for over 50 years and has obtained registration for many of these applications. Some of them are presented here, but if your specific needs are not included, contact your nearest Olin sales office. Additional data are on file, or we may be able to help you obtain the necessary government registrations.

Lobster Ponds

HTH® dry chlorinator will kill bacteria and control the growth of algae in lobster storage ponds that are separated from the open water by flood gates.

First, remove all lobsters from the pond. Open the gates so the pond will drain. Then remove all seaweed, lobster parts and feed fragments.

Apply 0.25 ounce of HTH dry chlorinator, in tablet or granular form (about two teaspoons), to every two square feet of the exposed mud and silt surfaces. Be sure that every empty burrow has been exposed to HTH dry chlorinator.

For the next step, use an empty HTH drum with ¼-inch holes drilled in the bottom half. At dead low tide, place the drum in the shallow pool of water in front of the gates. Using a thoroughly clean, dry two-gallon pail, add two or three pails of HTH tablets or granular to the drum.

After all the HTH dry chlorinator is dissolved, attach a hose to the suction end of a high pressure pump and spray equipment. Place the other end in the drum, then spray the chlorinated water on the face of the dam, gates and rocks to remove the slime and green algae.

After spraying, remove the drum and any equipment, open the gates and allow the incoming tidewater to dissolve all the HTH.

At high tide, close the gates for two or three days. After this period, all available chlorine should be used up.

Open the gates to allow the tide to flush the pond free of debris and dead algae. After at least two tidal cycles, and after determining that no chlorine residual remains in the pond, the gates may be closed and lobsters returned to the pond. Remember that HTH dry chlorinator, even in minute quantities, is toxic to fish and lobsters.

Fish Hatcheries

One ounce (three tablespoons) of HTH® dry chlorinator applied to every 25 gallons of water will sanitize fish tanks and raceways effectively.

Before treatment, remove all fish. Clean tanks and raceways thoroughly with soap and water to remove scum and dirt. Then rinse with clean water.

Apply proper amount of HTH dry chlorinator to the water in fish tanks and raceways. Allow one hour of exposure to this concentration, then rinse with clean water.

To sanitize other hatchery equipment, such as nets, use HTH solutions containing 200 ppm available chlorine.

First clean equipment thoroughly. Place in the HTH solution and allow to remain for one hour. Then rinse thoroughly with clean water.

Fish Ponds

HTH® dry chlorinator will control the growth of algae and kill many of the bacteria found in fish ponds.

First, remove all fish from the pond. Then, for every 500 gallons of water, use one ounce (three tablespoons) of HTH dry chlorinator, scattered evenly over the surface.

After waiting five minutes for the HTH dry chlorinator to disperse properly, test all parts of the pond for available chlorine. If the residual is below 1.0 ppm in any part of the pond, repeat the dosage of HTH dry chlorinator until 1.0 ppm is attained throughout.

Stop treatment once the residual has reached 1.0 ppm, and allow it to gradually drop to 0. (HTH dry chlorinator, even in small quantities, is toxic to fish.) Keep testing for available chlorine until the residual drops to 0 in all parts of the pond. Only then should the fish be placed back in the pond.

Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, rubber or PVC gloves and boots. Read label instructions before using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

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HTH® DRY CHLORINATOR FOR MARINE ENVIRONMENTS

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Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Toxicological Properties

The acute oral LD_{50} *(rat) is 850 mg/kg. The acute dermal* LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and is not known to be a carcinogen.

Storage and Handling

Store in a cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign material. Protect against physical damage. Drums may rupture if exposed to heat.

Spill and Leak Procedures

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use. (See Title 29, Section 1910.134, *Code of Federal Regulations.*) Wear goggles, coveralls and rubber, neoprene of PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. In the event of a large spill call 203-356-2345.

Disposal

Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regulatory agencies to ascertain proper disposal procedures.

Shipping Information

HTH® dry chlorinator is available in granular or tablet form in 100 lb. fiber drums.

Technical Assistance

Technical assistance is available to facilitate your further investigation of HTH® dry chlorinator. If you have a question or need more information, please call or write your nearest Olin Sales Office.

Keep HTH® out of reach of children. Danger. See principal label for complete precautionary information and storage and handling.

Sales Offices

Atlanta, GA 30328–1140 Hammond Dr., Suite 6150, (404) 394-5820
Deerfield Beach, FL 33441–700 W. Hillsboro Blvd., Suite 203, (305) 426-0101
Charlotte, NC 28280–1 NCNB Plaza, Suite 3505, (704) 373-1681
Cincinnati, OH 45242–8150 Corporate Park Dr., Suite 210, (513) 489-7990
Houston, TX 77027–4550 Post Oak Place Dr., Suite 221, (713) 960-0610
Oak Brook, IL 60521–2301 W. 22nd St., Suite 209, (312) 325-2280
Orange, CA 92668–500 S. Main St., Suite 910, No. Tower, (714) 558-9101
St. Louis, MO 63105–7777 Bonhomme Ave., Suite 1908, (314) 862-6705
Stamford, CT 06901–3 Landmark Square, Suite 205, (203) 356-3000
Wayne, PA 19087–997 Old Eagle School Rd., Suite 208, (215) 293-0990
International Sales–120 Long Ridge Rd., Stamford, CT 06904, (203) 356-2000

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HTH® DRY CHLORINATOR FOR TREATMENT OF INDUSTRIAL WASTE

HTH® dry chlorinator provides an easy and effective way to treat industrial waste.

Advantages of HTH® Dry Chlorinator

HTH dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

Waste material from all of the industries listed below can be treated using HTH dry chlorinator. Be sure to comply with all Federal, state and local regulations for sanitizing waste.

Cyanide Waste Treatment

The use of solutions of HTH® in water offers a simple, economical method of destroying harmful cyanides in plant waste.

In most cases, cyanide will be contained in liquid waste. When cyanide is found in solid waste, it must be dissolved in water to 500 ppm or less to prevent a high reaction temperature.

Approximately 4 pounds 3 ounces of HTH dry chlorinator per pound of free cyanide in the waste will oxidize the toxic cyanides, producing harmless cyanates. This reaction is slowed by the presence of monovalent nickel and copper in the waste liquid, so it's important to analyze the contents of the waste thoroughly before the HTH solution is prepared. Table 1 shows how much HTH dry chlorinator will be needed, depending on the content of the waste.

Batch Treatment: Where cyanide concentrations in waste are relatively high and the flow is within practical limitations (less than 10,000 gallons in an 8-hour period), batch treatment provides an effective, economical method of chlorination. The following is a general description of a typical batch treatment with HTH dry chlorinator:

Divert all waste water containing cyanides to a steel or concrete retention tank, located in a well-ventilated or open air area. Avoid mixing cyanide waste with acid waste, plant sewage and other plant waste.

The proper capacity of the retention tank is determined by the frequency of batches to be treated and the maximum volume of discharge during each collecting period. The tank should be equipped with an efficient agitator and a means of measuring the temperature.

Once waste is collected in the tank, agitate thoroughly to establish good uniformity.

If cyanide concentrations exceed 500 ppm, waste liquid should be diluted before treatment to prevent unusually high reaction temperatures. (Waste from plating and treating baths may sometimes contain more than 500 ppm of cyanide, whereas dragout water and wash water usually will not.)

If necessary, adjust the pH of the mixture to between 10 and 11 by adding caustic soda, with constant agitation. Be sure to maintain this level during the entire process, adding more caustic soda during treatment, when necessary. If the pH is allowed to fall below 7.0, highly toxic hydrogen cyanide gas may be generated.

Add 4 pounds 3 ounces of HTH dry chlorinator per pound of cyanide evenly over the surface of the waste liquid, while agitating. Make sure the final temperature of the solution is not above 49°C (120°F).

After agitating for at least 15 minutes, test for the presence of available chlorine. Use starch-iodide papers, a chlorine test kit or an analytical test procedure. If the presence of available chlorine is indicated, as is expected, hold the treated solution for a minimum of 1 hour without further agitation. If a minimum chlorine residual of 0.5 to 1.0 ppm is indicated, the waste may be considered free of cyanides.

In most cases, the required chlorine residual will be indicated in both the 15-minute and the 1-hour test. If either test indicates the absence of available chlorine, it is necessary to add more HTH dry chlorinator to produce the required chlorine residual. After a 5-minute agitation period, continue with the holding and testing steps described above. The objective is to insure the presence of excess available chlorine throughout the entire treating period, with an excess clearly indicated upon completion.

Table 1

Effect of Metal Content in Cyanide Waste on Amount of HTH® Dry Chlorinator Requirement

If present in waste		HTH per lb. of cyanide
Copper	Nickel	(pounds-ounces)
		4-3
•	•	4-11 to 5-8
	•	4-11 to 5-11
•		4-6 to 4-11

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OLIN CHEMICALS

HTH® DRY CHLORINATOR FOR TREATMENT OF INDUSTRIAL WASTE

Continuous Treatment: When the batch method is not practical or when continuous treatment is desirable, a uniform concentration of cyanide waste may be treated and monitored along its route from the retention basin or tank to the plant sewers.

Automatic process controls for the feeding of alkali and HTH solutions should be provided along with effluent line, allowing sufficient time lapse and agitation for complete reaction along the route of flow. Where necessary, provisions should be made for diluting highly concentrated waste. By providing additional laboratory control, this method can be operated as an effective, continuous process.

Treatment of Other Industrial Waste

Canneries: Solutions of HTH® containing 1,000 ppm available chlorine will control odors from dry food waste disposed of in dumps or collecting points. These accumulations of waste should be sprayed or soaked with HTH solutions daily, until odors are eliminated.

HTH solutions applied by continuous treatment to a residual of 15-25 ppm will control odors in food waste being removed by suspension in water.

Dairy Plants: HTH solutions containing 15-25 ppm available chlorine provide effective disinfection and odor control of dairy plant waste.

For continuous treatment, an overflow-type retention basin, flume or outfall of sufficient length is necessary to provide required contact time and mixing. HTH dry chlorinator is applied by a hypochlorinator capable of feeding the solution in proportion to waste flow.

The feeder should be located near the point where the waste leaves the plant building, followed by baffles to provide agitation.

For batch treatment, waste should be impounded and treated with HTH solutions to produce a residual of 15-25 ppm.

Beet Sugar Plants: HTH solutions containing 1-3% available chlorine will remove undesirable odors and impurities from reusable beet sugar waste water. The solution must remain in the waste for a contact period of 10-30 minutes.

Continuous treatment may be accomplished by gravity feed or by a hypochlorinator. The HTH solution should be applied to the waste water as soon as possible after it leaves the plant. After a contact period of at least 10 minutes, treated waste should show a residual of from 1 to 1.5 ppm.

For treatment of beet sugar waste water that will not be reused, apply HTH solutions to a residual of 10-15 ppm for at least 30 minutes, every 4 or 5 days. This process will prevent flume contamination.

Tanneries: HTH solutions will control bacterial activity and odors in tanning waste liquids.

All effluents which result from the soaking and treating of skins (up to the liming process) should be discharged into a retention basin and held for at least 2 hours.

The HTH solution may be fed directly into the effluent flow before it enters the retention basin or it may be introduced into the basin itself. A gravity feed tank which feeds a 3% available chlorine stock solution is recommended. Once the HTH solution has reached a residual of 250 ppm, waste liquid should be agitated.

How to Prepare Solutions of HTH® Dry Chlorinator[a]

Each of the applications listed above requires a specific concentration of solution, measured in parts per million (ppm) or percent of available chlorine. To prepare the proper strength solution follow these three simple steps:

1. Determine the volume[b] of the holding tank (in cubic feet or cubic inches).
2. Find the capacity of the tank in gallons. If the volume has been determined in cubic feet, use Formula (1). If the volume is in cubic inches, use Formula (2).
   (1) Gallons = 7.48 x volume in cubic feet
   (2) Gallons = .0043 x volume in cubic inches
3. Use Tables 2 and 3 to determine how many ounces of HTH dry chlorinator must be added to the number of gallons of water to obtain the required ppm or % of available chlorine. (Never add HTH dry chlorinator to anything but water.) For a volume of water that does not appear in Tables 2 or 3, simply calculate between values.

Table 2

Required Amounts of HTH® Dry Chlorinator* (Pounds-Ounces)

Available Chlorine (ppm)	Water (Gallons)				
	10	50	100	500	1,000
15		0-¼	0-⅜₁₀	0-1½	0-3
25		0-¼	0-½	0-2½	0-5¼
250	0-½	0-2½	0-5¼	1-10	3-4
1,000	0-2	0-11	1-5	6-8	13-0

Table 3

Required Amounts of HTH® Dry Chlorinator (Pounds-Ounces)

Available Chlorine (%)	Water (Gallons)			
	1	5	10	50
1	0-2	0-11	1-5	6-8
2	0-4	1-5	2-10	13-0
3	0-7	1-15	3-15	19-9

*For convenience in measuring small quantities 2 teaspoons of granular HTH equals approximately ¼ ounce.

Storage and Handling

Store in cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign

*Stock solutions should be freshly prepared and kept in properly labeled containers to protect against contamination. Unused stock solutions should be discarded.

[b]Volume of a rectangular tank: V = Length x Width x Height
Volume of a circular tank: V = 3.142 x Radius x Radius x Height
or
V = 0.785 x Diameter x Diameter x Height

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material. Protect against physical damage. Drums may rupture if exposed to heat.

Toxicological Properties

The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and is not known to be a carcinogen.

Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, rubber or PVC gloves and boots. Read label instructions before using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Spill and Leak Procedures

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use (see Title 29, Section 1910.134, *Code of Federal Regulations*). Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. Wash all contaminated clothing before reuse. In the event of a large spill call 203-356-2345.

Disposal

Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regulatory agencies to ascertain proper disposal procedures.

Shipping Information

HTH® dry chlorinator is available in granular or tablet form in 100 lb. fiber drums.

Technical Assistance

Technical assistance is available to facilitate further investigation of HTH® dry chlorinator. If you have a question or need more information, please call or write your nearest Olin Sales Office.

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Under the Federal Insecticide, Fungicide, and Rodenticide Act, as amended, for the pesticide registered under EPA Reg. No. 1258-1069

Keep HTH® out of reach of children. Danger. See principal label for complete precautionary information and storage and handling.

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HTH® DRY CHLORINATOR FOR THE CONTROL OF MILDEW AND FUNGI

HTH® dry chlorinator is effective in killing and removing mildew and fungi, and in preventing their growth. It is a concentrated form of calcium hypochlorite that contains 65% available chlorine, an effective mildew and fungi remover. The following information is a reference guide to help prepare formulations containing HTH for their control.

All commercial sanitizers sold for biocidal applications must be registered with the Environmental Protection Agency (EPA). Olin has produced HTH dry chlorinator for over 50 years and has obtained registration for many of these applications. Some of them are presented here, but if your specific needs are not included, contact your nearest Olin sales office. Additional data are on file, or we may be able to help you obtain the necessary government registrations.

Preparation of Aqueous Solution for Mildew[a]

To make up a 3.5% available chlorine solution, use the following for each 100 gallons of water:

Ingredients	*Quantity*
Tap Water (gal)	100
HTH® Dry Chlorinator, granular (lb)	48
Caustic Solution, 50% (lb)	3.4

Directions

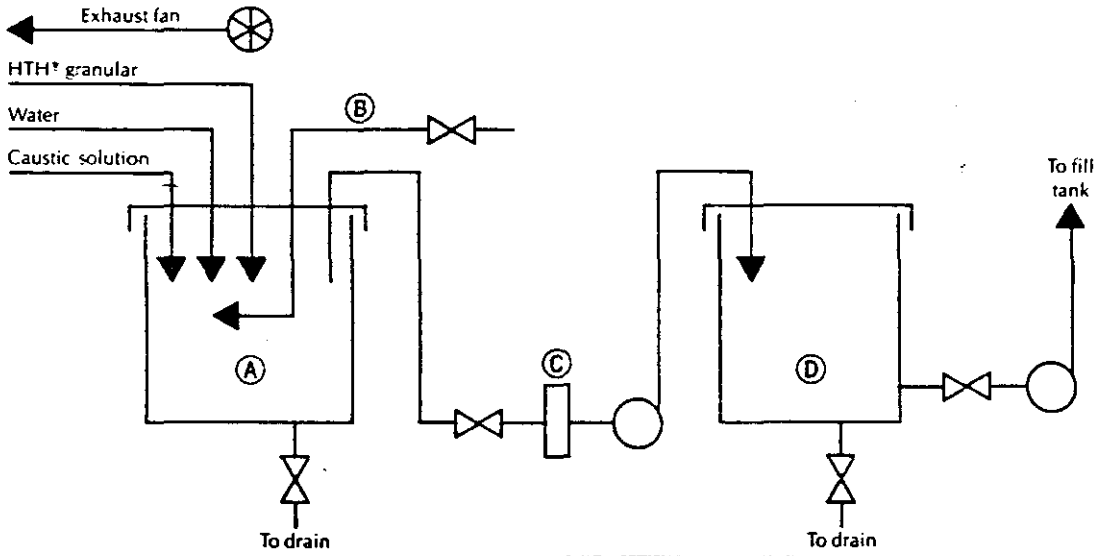
Add the required volume of tap water to the dissolving tank. With the exhaust fan operating, gradually add the proper amount of granular HTH® dry chlorinator to the water, while agitating by means of a sparge line. (A corrosion resistant agitator shaft and blade may be used instead of a sparge line.)

Then add the required amount of caustic solution to the HTH solution, while agitating. Depending on the degree of agitation, continue to mix for one to two hours. After mixing, stop the agitation and let the small amount of insolubles settle to the bottom.

For the next step, you'll need a special test kit designed to measure available chlorine. (Olin can recommend one appropriate for your application.) Test for available chlorine in the clear upper solution to see if all the HTH dry chlorinator is in solution. A low level of available chlorine may indicate the need for additional mixing. If necessary, repeat mixing.

Allow insolubles to settle out for four to six hours or overnight. Then pump the upper solution through the filter to the holding tank. While pumping, place the transfer line into the solution above the insolubles which are on the bottom of the dissolving tank.

Figure 1
Schematic Flow Diagram for Preparing HTH® Solutions



Equipment

(A) Dissolving tank with lid (polyethylene)
(B) Sparge line (polyethylene or polyvinyl chloride)
(C) Filter (5 micron; Cuno® or equivalent)
(D) Solution holding-tank with lid (polyethylene)
— Centrifugal transfer pumps (corrosion-resistant, plastic or lined)
— Plug valves and pipe (polyvinyl chloride)

[a]Stock solutions should be freshly prepared and kept in properly labeled containers to protect against contamination. Unused stock solutions should be discarded.

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HTH® DRY CHLORINATOR FOR THE CONTROL OF MILDEW AND FUNGI

Check the quality of the solution in the holding tank by determining the temperature, percent of available chlorine and the pH.

Stability

The stability of solutions containing HTH® dry chlorinator, in general, depends on five factors:

- Concentration of HTH dry chlorinator
- Concentration of certain catalysts
- Total alkalinity of pH value of the solution
- Temperature of the solution
- Exposure to sunlight

Copper, nickel and cobalt are catalysts of decomposition. Copper from brass, bronze or copper fittings, and nickel from stainless steel equipment may find their way into the solution. Cobalt, which has the least effect, is not likely to be encountered.

If aluminum, copper, iron, nickel and other impurities are avoided while preparing the solution, decomposition will be minimized. Decomposition can also be retarded by controlling the alkalinity of the solution with excess caustic soda. (In strong hypochlorite solutions, it is customary to refer to "excess total alkalinity".)

The quality of an HTH solution depends greatly on its stability, which is enhanced under the following conditions:

- As little iron, copper and nickel as possible
- Low concentration of HTH dry chlorinator
- pH of about 12
- Excess total alkalinity of 0.15% to 0.20% as NaOH
- Storage at low temperatures, in containers which are opaque to light, for maximum shelf life

Determination of pH

The most practical method of determining the pH of solutions of HTH® is by using a glass electrode and pH meter. Use high-alkalinity electrodes for the measurement.

The pH meter should be standardized before measuring the pH of the sample solution. Commercial standard buffer solutions covering the various pH ranges may be used.

Determination of Calcium Hypochlorite and Total Alkalinity

Hypochlorite and total alkalinity are determined on the same sample by adding a measured excess of standard acid, titrating the hypochlorite with standard thiosulfate, and back-titrating the excess of acid with standard alkali.

Equations:

(Eq.1) $Ca(OCl)_2 + 4\,KI + 4\,HCl \rightarrow CaCl_2 + 4\,KCl + I_2 + 2\,H_2O$

(Eq. 2) $Ca(OH)_2 + 2\,HCl \rightarrow CaCl_2 + 2H_2O$

(Eq. 3) $2\,I_2 + 4Na_2S_2O_3 \rightarrow 2\,Na_2S_4O_6 + 4\,NaI$

(Eq. 4) $HCl\ (Excess) + NaOH \rightarrow NaCl + H_2O$

Reagents:

Sodium thiosulfate ($Na_2S_2O_3$), standard 0.1 N solution
Potassium iodide (KI), granular, neutral or A.C.S. reagent grade
Hydrochloric acid (HCl), standard 0.1 N solution
Sodium hydroxide (NaOH), standard 0.1 N solution
Starch indicator, 0.5% solution
Bromcresol green indicator, 0.1% solution
Glacial acetic acid (used when testing for calcium hypochlorite only and not for total alkalinity)

Procedures:

Accurately weigh out a 3.5-g sample of the solution and transfer to a 500-ml Erlenmeyer flask. Dilute with about 100 ml of distilled H_2O. Add 2 g KI crystals (neutral); mix, then add from a buret sufficient standard 0.1 N HCl to provide an excess over that required by reaction equations 1 and 2 (50 ml is usually sufficient). Record the volume of acid used as "ml HCl".

Immediately titrate the liberated iodine with standard 0.1 N $Na_2S_2O_3$, adding 2 ml of starch indicator solution when most of the yellow iodine color has disappeared. Carefully finish the titration until the blue starch-iodide color just disappears. Record the volume of solution used as "ml Thio A".

Add 5 drops of bromcresol green indicator solution and titrate the excess HCl with standard 0.1 N NaOH to the end point when the color just turns from greenish-blue to blue. Record the volume of solution used as "ml NaOH".

Calculations:

$$\%\ Ca(OCl)_2 = \frac{\text{ml Thio A} \times N \times 3.5746}{\text{g of sample}}$$

$$\%\ \text{Available Chlorine (as } Cl_2) = \frac{\text{ml Thio A} \times N \times 3.5453}{\text{g of sample}}$$

$$\%\ \text{Total Alkalinity as NaOH} = \frac{(\text{ml HCl} \times N) - [(\text{ml Thio A} \times N) + (\text{ml NaOH} \times N)] \times 4.0}{\text{g of sample}}$$

Notes:

1. If a pure blue color appears before the addition of sodium hydroxide solution, there is no excess acid to be titrated. The total alkalinity cannot be determined on this sample and the thiosulfate titration is probably low. Discard the sample and the results. Weigh out a fresh sample and treat as before but use a larger volume (75 ml) of standard 0.1 N HCl solution.
2. If percent calcium hypochlorite only is desired, the use of standard HCl is unnecessary. Simply follow the addition of KI by the addition of 10 ml glacial acetic acid. Then titrate the liberated iodine as described above. Record the volume of standard thiosulfate used as "ml Thio A" and calculate % $Ca(OCl)_2$ or % available chlorine as shown.

Storage and Handling

Store in cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign material. Protect against physical damage. Drums may rupture if exposed to heat.

Toxicological Properties

The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and is not known to be a carcinogen.

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Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, rubber or PVC gloves and boots. Read label instructions before using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Spill and Leak Procedures

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use. (See Title 29, Section 1910.134 *Code of Federal Regulations.*) Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. In the event of a large spill call 203-356-2345.

Disposal

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Shipping Information

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Technical Assistance

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Keep HTH® out of reach of children. Danger. See principal label for complete precautionary information and storage and handling.

This bulletin and the information contained herein are offered solely for your consideration, investigation and verification. No representations or warranties, express or implied, of merchantability or otherwise, are made or contained herein. Olin's responsibility for any claims arising in connection herewith shall in no event exceed the purchase price or fair market value of the material. User may be responsible for compliance with all applicable Federal, state and local laws and regulations regarding the product and its storage and handling. Nothing contained herein shall be construed to constitute permission or a recommendation to practice any invention covered by a patent or patent application or know-how owned by Olin Corporation or by others.

The use of HTH® dry chlorinator for the purposes described in this bulletin has been registered with the United States Environmental Protection Agency, but may not have been approved or registered for use or sale for such purposes in other countries. Olin Corporation assumes no responsibility for compliance with the laws of any country except the United States.

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HTH® DRY CHLORINATOR FOR SANITIZATION OF BEVERAGE PLANTS

Sanitization with HTH® dry chlorinator is an easy and effective way to destroy harmful bacteria that can contaminate beverage products. Sanitization of the water supply, all manufacturing equipment and potential problem areas will protect the quality, taste and odor of beverages.

Advantages of HTH® Dry Chlorinator

HTH dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

All commercial sanitizers sold for biocidal applications must be registered with the Environmental Protection Agency (EPA). Olin has produced HTH dry chlorinator for over 50 years and has obtained registration for many of these applications. Some of them are presented here, but if your specific needs are not included contact your nearest Olin Sales Office. Additional data are on file or we may be able to help you obtain the necessary registration.

In all of the beverage industries listed below, solutions of HTH dry chlorinator can be used to sanitize plant operations. Be sure to comply with all Federal, state and local regulations for sanitizing beverage plants.

Breweries

Solutions of HTH® provide breweries with a proven disinfectant that helps prevent bacterial growth while preserving the pure, fresh taste of the finished product.

General Sanitization: Because of its dissolving action on proteins, beer stone, slime, yeast and extraneous matter found in lines, tanks, hoses and other brewery equipment, HTH dry chlorinator is an effective general sanitizer for the entire plant. Fresh solutions may be prepared using the following procedure.

To prepare a stock solution, first dissolve 5 pounds of HTH dry chlorinator in 2 to 3 gallons of warm water, using a 20 gallon container. Introduce 3 pounds of soda ash and stir until dissolved. Dilute to about 15 gallons with cold water, then add 5 pounds of flake caustic soda. Stir until dissolved and allow to settle.

This mixture, diluted in proportions of 1 gallon of stock solution to 10 gallons of water, may be used to clean and sanitize stainless steel, tile, concrete vats, piping and equipment. Rinse all treated equipment with potable water before reusing.

Filter Pulp: HTH solutions remove colloidal deposits and coloring matter on wood pulp being used as a filtering agent, thereby restoring maximum efficiency.

First, wash the filter mass in the usual manner. If a washer has been used, be sure to shut off the flow of water after washing. Add 1 ounce of HTH dry chlorinator or ½ gallon of 1% HTH stock solution for each gallon of water in the washer. Then run it for an hour.

If a washer is not used, place the pulp in soak water and stir in 1 ounce of HTH dry chlorinator or ½ gallon of HTH stock solution for each gallon of water. Let it remain at 140°-150°F for 10-15 minutes. Then remove pulp and rinse it with potable water.

Cypress Fermenting Tubs: Clean tub thoroughly to free it of all surface oil. Then fill with either HTH solution containing 500 ppm available chlorine or with ½ gallon of stock solution for every 10 gallons of water. Allow solution to remain overnight, then drain and rinse well with potable water before adding wort.

Washing Equipment and False Bottoms: To sanitize false bottoms, cover them with warm water and sprinkle on 1 pound of HTH dry chlorinator for every 4 gallons of warm water used. A 15-20 minute contact period is sufficient.

To sanitize the entire washing apparatus, including false bottoms, first cleanse in the usual way. Then flush all surfaces generously with an HTH solution containing 500 ppm available chlorine.

Rinse all treated equipment with potable water before reusing.

Grain Steep Tanks: Sanitization with HTH dry chlorinator controls the growth of mold which often occurs in the highly humid conditions in malt houses.

To sanitize steep tanks, first wash lightly with water. Then spray with an HTH solution containing 1.5 to 2.0% available chlorine. After 30 minutes contact time, wash tanks thoroughly with high-pressure potable water.

The walls of concrete germination compartments should be washed with water before treatment. Then spray with an HTH solution containing 1.5 to 2.0% available chlorine. After 30 minutes contact time, wash walls thoroughly with high-pressure potable water.

The perforated metal floors of the germination compartment should be washed with high-pressure water before treatment. Using a clean, dry, uncontaminated lawn fertilizer spreader, apply 0.15 ounces of HTH dry chlorinator per square foot to the wet floor. After 30 minutes contact time, wash floors thoroughly with high-pressure potable water.

Malting Areas: At least once a week, the floors and walls around malt tanks should be thoroughly washed down to prevent the formation of molds and offensive odors. Wooden

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1. Determine the volume[b] of the holding tank (in cubic feet or cubic inches).
2. Find the capacity of the tank in gallons. If the volume has been determined in cubic feet, use Formula (1). If the volume is in cubic inches, use Formula (2).
   (1) Gallons = 7.48 x Volume in cubic feet
   (2) Gallons = .0043 x Volume in cubic inches
3. Use Tables 1 and 2 to determine how many ounces of HTH dry chlorinator must be added to the number of gallons of water to obtain the required ppm or % of available chlorine. (Never add HTH dry chlorinator to anything but water.) For a volume of water that does not appear in Tables 1 or 2, simply calculate between values.

Storage and Handling

Store in cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign material. Protect against physical damage. Drums may rupture if exposed to heat.

Toxicological Properties

The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and is not known to be a carcinogen.

Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, rubber or PVC gloves and boots. Read label instructions before using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Spill and Leak Procedures

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use (see Title 29, Section 1910.134, *Code of Federal Regulations*). Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. Wash all contaminated clothing before reuse. In the event of a large spill call 203-356-2345.

[b] Volume of a rectangular tank: V = Length x Width x Height
Volume of a circular tank: V = 3.142 x Radius x Radius x Height
or
V = 0.785 x Diameter x Diameter x Height

Table 1
Required Amounts of HTH® Dry Chlorinator*
(Pounds-Ounces)

Available Chlorine (ppm)	Water (Gallons)				
	10	50	100	500	1,000
15			0-3/10	0-1½	0-3
200	0-4/10	0-2	0-4	1-5	2-10
250	0-½	0-2½	0-5	1-9	3-2
300	0-6/10	0-3	0-6	2-0	3-15
500	0-1	0-6	0-11	3-4	6-8
1,000	0-2	0-11	1-5	6-8	13-0

Table 2
Required Amounts of HTH® Dry Chlorinator
(Pounds-Ounces)

Available Chlorine (%)	Water (Gallons)				
	1	5	10	50	100
0.25	0-½	0-2½	0-6	1-10	3-4
0.5	0-1	0-6	0-11	3-4	6-8
1.0	0-2	0-11	1-5	6-8	13-0
1.5	0-3	1-0	1-15	9-12	19-9
2.0	0-4	1-5	2-10	13-0	26-1
3.0	0-7	1-15	3-15	19-9	39-2

*For convenience in measuring small quantities, 4 teaspoons of granular HTH equals approximately ½ ounce.

Disposal

Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regulatory agencies to ascertain proper disposal procedures.

Shipping Information

HTH® dry chlorinator is available in granular or tablet form in 100 lb. fiber drums.

Technical Assistance

Technical assistance is available to facilitate further investigation of HTH® dry chlorinator. If you have a question or need more information, please call or write your nearest Olin Sales Office.

floors should be flushed with HTH solutions containing approximately 0.25% available chlorine. This solution may also be used to spray the walls of malting spaces.

Aging Cellars: The concrete walls of aging cellars should be sprayed regularly with HTH solutions containing 0.5% available chlorine. This procedure will kill existing mold and mildew growths and control odors.

Pasteurizers: HTH solutions effectively control slime and odors that often develop in pocket type pasteurizers.

HTH solutions containing 1% available chlorine should be fed into the pasteurizer's water supply line by a hypochlorinator. Adjust the hypochlorinator to a feed rate that provides a dosage of 0.5 to 1.0 ppm available chlorine at the pasteurizer overflow. When refilling pasteurizers after draining and cleaning, the hypochlorinator should be used to provide fresh water with the proper chlorine residual.

Water Supplies: HTH solutions containing 1% available chlorine will properly sanitize plant water used in the production of beer.

The HTH solution should be introduced into the water supply by a hypochlorinator. An available chlorine residual of 0.1 to 0.2 ppm must be maintained throughout the system at all times. Be sure to dechlorinate the water before it is used to process beer.

Carbonated Beverages

Equipment: Regular treatment of all manufacturing equipment (lines, coolers, fillers, tanks) with solutions of HTH® is a reliable, economical way to control bacteria and help guarantee proper quality and taste of carbonated beverages.

Before bottling operations begin, an HTH solution containing 300 ppm available chlorine should be fed through all pumps, lines and fillers that will contain beverage ingredients. (You may also use stock solution, one pint for every 4 gallons of potable water.) Rinse all treated equipment with potable water before reusing.

After each bottling operation, all tanks which hold syrups should be thoroughly sprayed with an HTH solution containing 300 ppm available chlorine. After a 30 minute contact period, rinse tanks by hosing with potable water.

Water Supplies: HTH solutions containing 1% available chlorine will properly sanitize plant water used in the production of carbonated beverages.

The HTH solution should be introduced into the water supply by a hypochlorinator. An available chlorine residual of 0.1 to 0.2 ppm must be maintained throughout the system at all times. Be sure to dechlorinate the water before it is used to process beverages.

Cider Plants

Sweet cider, stored under cold conditions, frequently develops a fungus growth which causes spoilage. Solutions of HTH® containing 3% available chlorine will prevent this fungus growth and keep cider from spoiling. Clean each cask thoroughly, then rinse with the HTH solution. Remember to rinse treated casks completely with potable water before refilling.

Wineries

Plant Sanitization: Proper disinfection with HTH® dry chlorinator will prevent contamination in wineries and help insure product quality. After each run, the entire plant area and its equipment should be cleaned. Then, immediately before the next run, disinfect with HTH dry chlorinator, using the following procedure.

Rinse the non-porous surfaces of all walls, floors and equipment with an HTH solution containing 500 ppm available chlorine. After 10 minutes, use potable water to rinse any surface that may come into contact with the wine.

Rough surfaces (wood, concrete, etc.) should be swabbed or sprayed with an HTH solution containing 1000 ppm available chlorine. After 10 minutes, any surface that will come into contact with the wine should be rinsed thoroughly with potable water.

Storage vessels, fermenting vats, casks, presses and grape crushers should all be cleaned thoroughly before treatment. Then rinse or spray with HTH solution containing 200 ppm available chlorine. After 10 minutes, equipment should be washed thoroughly with potable water.

To sanitize bottles and corks, immerse them for 5 minutes in a tank containing 200 ppm available chlorine. Rinse thoroughly to remove any remaining chlorine.

Mold Control: Any sign of mold growth should be treated immediately with HTH dry chlorinator, to prevent further spreading.

Scrub or spray the affected surfaces with an HTH solution containing 0.5% available chlorine. Heavy mold growths may require repeated applications.

Filling and Storage Tanks: Regular disinfection of filling and storage tanks with HTH dry chlorinator will help maintain a high level of product quality.

After every run (just before refilling) tanks should be thoroughly sanitized with HTH dry chlorinator. Wooden tanks should be filled with HTH solutions containing 500 ppm available chlorine. Solutions should be left for an hour and then removed. Rinse with potable water before refilling.

Metal or tile tanks should be filled with HTH solutions containing 250 ppm available chlorine. Wait a few minutes, then remove the solution.

When not in use, tanks and vats should be sanitized regularly with HTH dry chlorinator. Fill each receptacle with water and add HTH solutions to reach a residual of approximately 15 ppm available chlorine. Test the water every week and repeat treatment if the residual falls below 2 ppm.

Press Cloths: Press cloths contaminated with bacteria and organic matter should be treated with HTH solutions to neutralize microorganisms and prevent them from spreading.

After using, wash cloths well. Then prepare the proper solution using the following procedure: For every 100 pounds dry weight of the cloth, add 2 ounces of HTH dry chlorinator to 60 gallons of water and soak for 15 minutes.

Grape Juice Plants

To sanitize equipment and problem areas in grape juice plants, follow the same treatment procedures recommended for wineries.

How to Prepare Solutions of HTH® Dry Chlorinator*

Each of the applications listed above requires a specific concentration of solution, measured in parts per million (ppm) or percent of available chlorine. To prepare the proper strength solution follow these three simple steps:

*Stock solutions should be freshly prepared and kept in properly labeled containers to protect against contamination. Unused stock solutions should be discarded.

Keep HTH® out of reach of children. Danger. See principal label for complete precautionary information and storage and handling.

This bulletin and the information contained herein are offered solely for your consideration, investigation and verification. No representations or warranties, express or implied, of merchantability or otherwise, are made or contained herein. Olin's responsibility for any claims arising in connection herewith shall in no event exceed the purchase price or fair market value of the material. User may be responsible for compliance with all applicable Federal, state and local laws and regulations regarding the product and its storage and handling. Nothing contained herein shall be construed to constitute permission or a recommendation to practice any invention covered by a patent or patent application or know-how owned by Olin Corporation or by others.

The use of HTH® dry chlorinator for the purposes described in this bulletin has been registered with the United States Environmental Protection Agency, but may not have been approved or registered for use or sale for such purposes in other countries. Olin Corporation assumes no responsibility for compliance with the laws of any country except the United States.

Sales Offices

Atlanta, GA 30328–1140 Hammond Dr., Suite 6150, (404) 394-5820
Deerfield Beach, FL 33441–700 W. Hillsboro Blvd., Suite 203, (305) 426-0101
Charlotte, NC 28280–1 NCNB Plaza, Suite 3505, (704) 373-1681
Cincinnati, OH 45242–8150 Corporate Park Dr., Suite 210, (513) 489-7990
Houston, TX 77027–4550 Post Oak Place Dr., Suite 221, (713) 960-0610
Oak Brook, IL 60521–2301 W. 22nd St., Suite 209, (312) 325-2280
Orange, CA 92668–500 S. Main St., Suite 910, No. Tower, (714) 558-9101
St. Louis, MO 63105–7777 Bonhomme Ave., Suite 1908, (314) 862-6705
Stamford, CT 06901–3 Landmark Square, Suite 205, (203) 356-3000
Wayne, PA 19087–997 Old Eagle School Rd., Suite 208, (215) 293-0990
International Sales–120 Long Ridge Rd., Stamford, CT 06904, (203) 356-2000

OLIN CHEMICALS

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HTH® DRY CHLORINATOR FOR TREATMENT OF INDUSTRIAL COOLING WATER

Treatment with HTH® dry chlorinator is an easy and effective way to control the growth of slime in industrial cooling water. By destroying the algae, fungi and bacteria that cause slime, HTH dry chlorinator eliminates flow restrictions to insure maximum cooling efficiency and minimum energy expenditures.

Advantages of HTH® Dry Chlorinator

HTH dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

All commercial sanitizers sold for biocidal applications must be registered with the U.S. Environmental Protection Agency (EPA). Olin has produced HTH dry chlorinator for over 50 years and has obtained registration of many of these applications. Some of them are presented here, but if your specific needs are not included, contact your nearest Olin sales office. Additional data are on file, or we may be able to help you obtain the necessary government registrations.

Air Conditioning

Slime often develops on the water sides of cooling surfaces in commercial air conditioning systems, greatly reducing cooling efficiency and sometimes causing flow restrictions and unpleasant odors.

HTH® dry chlorinator, which can be added in solution or dry, will control the growth of slime in air conditioning water.

A daily dosage should provide a chlorine residual of 1 ppm in all parts of the system for a four hour period. Under some conditions it may be necessary to temporarily increase the chlorine residual or contact time.

In recirculating systems where an open section is accessible, HTH dry chlorinator should be fed into the flow as rapidly as the water will dissolve it.

In closed systems, HTH solutions should be applied by a gravity feed or a hypochlorinator.

Ice Plants

The growth of slime often occurs in ice plant condensing systems, causing increased pressure, lowering efficiency and adding to power costs.

One ounce of HTH® dry chlorinator for every 5,000 gallons of water in the cooling system will effectively control the growth of slime.

In recirculating systems with an accessible open section, HTH dry chlorinator may be applied directly to cooling water.

In closed systems, HTH solutions should be fed by a pump or gravity feed located near the intake side of the recirculating pump.

In both cases, be sure that HTH dry chlorinator is evenly distributed throughout the entire system, then check for available chlorine. If a residual of 1 ppm is present in all parts of the system, the water has been properly chlorinated. Test for chlorine residual periodically and add HTH dry chlorinator as often as necessary to maintain 1 ppm throughout the system.

Power Plants

Cooling Towers: Slime, which often grows in condensers and on cooling surfaces of recirculating systems, reduces efficiency significantly.

One ounce of HTH® dry chlorinator for every 5,000 gallons of water in the system will control slime and help maximize cooling efficiency.

In systems where an accessible open section exists, HTH dry chlorinator may be applied directly to the cooling water. Select a point where enough turbulence exists for HTH dry chlorinator to dissolve quickly and completely.

When direct application is not possible, HTH solutions should be introduced into cooling water by a gravity feed or by mechanical means. Select an application point that will insure thorough diffusion of the HTH solution in water traveling to the condenser and coolers.

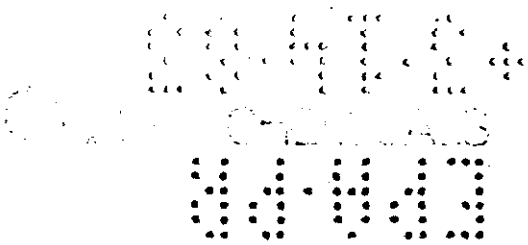
After circulating long enough to insure that the HTH has reached all parts of the system, test the water for available chlorine. If a residual of 1 ppm is present throughout the system, the water has been sufficiently chlorinated. Test water for chlorine residual periodically and add HTH dry chlorinator as often as necessary to maintain 1 ppm in all parts of the system.

Cooling Ponds and Reservoirs: Slime originating in ponds and reservoirs that supply cooling systems and boilers can often cause problems inside the plant.

One ounce of HTH granular for every 5,000 gallons of pond water will effectively control slime, to help prevent its further growth and interference with operations inside the plant.

Ponds and reservoirs which are fed by surface streams may be continuously treated with solutions of HTH dry chlorinator. Either mechanical or gravity feeders should be set up at the pond or reservoir inlet to introduce the HTH solution.

Once the solution has been distributed evenly throughout the entire body of water, test for available chlorine. A chlorine residual of 1 ppm in all parts of the water will be sufficient to control the growth of slime. Maintain this residual at all times by applying more HTH dry chlorinator whenever necessary.



Canneries

Freshly-packed hot cans are often cooled by immersion in cold water. This process creates a partial vacuum inside the container which may allow cooling water to enter through seams or pin holes. If any bacteria exist in the water, the can contents may become contaminated and spoil.

Solutions of HTH® will sanitize cooling water and protect canned goods from contamination and spoilage.

HTH solutions containing 1% available chlorine should be *fed into cooling tanks or channels by an elevated tank to reach* a concentration of 2 ppm available chlorine. The flow may be safely controlled by using a pinch stop on a rubber hose or a non-corroding valve.

Dosage points should be properly located to provide a uniform distribution of the solution throughout the entire system. If channels or tanks are long and narrow, it may be necessary to apply the HTH solution at two points to insure proper distribution.

Check the cooling water for available chlorine. If a chlorine residual of 2 ppm is present throughout the system, the water has been properly sanitized.

Check for available chlorine every hour until dosage requirements are established. Then, check every two or three hours to be sure that an available chlorine residual of 2 ppm is maintained throughout the cooling system.

How to Prepare Solutions of HTH® Dry Chlorinator[a]

Each of the applications listed above requires a specific concentration of solution, measured in percent of available chlorine. To prepare the proper strength solution follow these three simple steps:

1. Determine the volume[b] of the holding tank (in cubic feet or *cubic inches*).
2. Find the capacity of the tank in gallons. If the volume has been determined in cubic feet, use Formula (1). If the volume is in cubic inches, use Formula (2).
   (1) Gallons = 7.48 x Volume in cubic feet
   (2) Gallons = .0043 x Volume in cubic inches
3. Use Table 1 to determine how many ounces of HTH dry chlorinator must be added to the number of gallons of water to obtain the required % of available chlorine. *(Never add HTH dry chlorinator to anything but water.)* If the volume of water you're using does not appear in Table 1 you may calculate between values.

Table 1

Required Amounts of HTH® Dry Chlorinator (Pounds-Ounces)

Available Chlorine (%)	Water (Gallons)				
	1	5	10	50	100
1	0-2	0-11	1-5	6-8	13-0
2	0-4	1-6	2-10	13-0	26-0

[a] Stock solutions should be freshly prepared and kept in properly labeled containers to protect against contamination. Unused stock solutions should be discarded.

[b] Volume of a rectangular tank: V = Length x Width x Height
Volume of a circular tank: V = 3.142 x Radius x Radius x Height
or
V = 0.785 x Diameter x Diameter x Height

Storage and Handling

Store in cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign material. Protect against physical damage. Drums may rupture if exposed to heat.

Toxicological Properties

The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and is not known to be a carcinogen.

Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, *rubber or PVC gloves and boots. Read label instructions before* using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large *amounts of water. If person is conscious and vomiting, place* face down with head lower than hips. Get immediate medical attention.

Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Spill and Leak Procedures

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use. (See Title 29, Section 1910.134, *Code of Federal Regulations*.) Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return *spilled material to original container. Place in a fresh con*tainer and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. In the event of a large spill call 203-356-2345.

Disposal

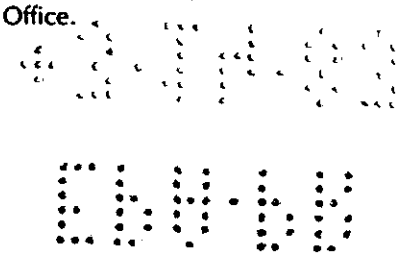
Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regulatory agencies to ascertain proper disposal procedures.

Shipping Information

HTH® dry chlorinator is available in granular or tablet form in 100 lb. fiber drums.

Technical Assistance

Technical assistance is available to facilitate your further investigation of HTH® dry chlorinator. If you have a question or need more information, please call or write your nearest Olin Sales Office.



Keep HTH® out of reach of children. Danger. See principal label for complete precautionary information and storage and handling.

This bulletin and the information contained herein are offered solely for your consideration, investigation and verification. No representations or warranties, express or implied, of merchantability or otherwise, are made or contained herein. Olin's responsibility for any claims arising in connection herewith shall in no event exceed the purchase price or fair market value of the material. User may be responsible for compliance with all applicable Federal, state and local laws and regulations regarding the product and its storage and handling. Nothing contained herein shall be construed to constitute permission or a recommendation to practice any invention covered by a patent or patent application or know-how owned by Olin Corporation or by others.

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HTH® DRY CHLORINATOR FOR SANITIZATION OF FOOD PROCESSING OPERATIONS

Sanitization with HTH® dry chlorinator is an easy and effective way to control harmful bacteria that can contaminate food products, processing equipment and seeds.

Treatment with HTH dry chlorinator will help keep food safe for consumption, and decontaminate processing equipment.

Advantages of HTH® Dry Chlorinator

HTH dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

All commercial sanitizers sold for biocidal applications must be registered with the U.S. Environmental Protection Agency (EPA). Olin has produced HTH dry chlorinator for over 50 years and has obtained registration for many of these applications. Some of them are presented here, but if your specific needs are not included contact your nearest Olin sales office. Additional data are on file, or we may be able to help you obtain the necessary government registrations.

Egg-Breaking Operations

Solutions of HTH® dry chlorinator will control bacteria on contaminated eggs and sanitize all equipment and areas involved in egg-breaking operations.

Separate all dirty eggs from clean ones. First clean them *thoroughly with a detergent solution spray. Then prepare an* HTH solution containing 100 ppm available chlorine in warm potable water. Spray all eggs with this solution.

All egg cups, breaking knives, trays and other equipment that come in contact with "off" eggs should be thoroughly cleaned and sanitized. First, clean all equipment with washing powder and rinse with clear water. Then, just before placing back in use, spray with an HTH solution containing 50 to 200 ppm available chlorine, as authorized by the USDA for use in Federally inspected meat, poultry, rabbit and egg plants.

In egg-breaking rooms, all equipment, walls and floors should be deodorized and sanitized with solutions of HTH dry chlorinator. After cleaning, and just before using, spray, wipe or rinse tables, stools, walls and floors with an HTH solution containing 1,000 ppm available chlorine. Food contact surfaces must be rinsed with potable water prior to use.

To sanitize egg freezers and dryers (tanks, pipelines and pumps), use the spray (or fog) method of treatment. This procedure is generally used to sanitize large, non-porous surfaces that have already been freed of physical soil.

Prepare an HTH solution containing 200 ppm available chlorine. If possible, use pressure spraying or fogging equipment that is designed to resist hypochlorite solutions (plastic, rubber coated, or stainless steel). When using any other kind of spraying equipment, be sure to empty and rinse thoroughly with fresh water immediately after treatment.

Apply spray of fog heavily to all surfaces the eggs will touch. All treated surfaces, corners and turns should be thoroughly sprayed. Allow excess solution to drain off, then place in service.

Fish Filleting

Solutions of HTH® dry chlorinator will control the growth of slime on fish and prevent increasing bacterial count during the filleting and packaging stages. Fill a wash tank with water and add HTH dry chlorinator to a residual of 25 ppm. Place the eviscerated, degilled fish in the water. Remove fish from the water and refrigerate at 3° C (37° F) for 24 to 48 hours. The fish should then be scaled and washed again in an HTH solution as above. Then they are ready for filleting and packaging.

Pecan Cracking and Bleaching

Solutions of HTH® dry chlorinator can be used to control bacteria in pecans and also to bleach the shells in preparation for dyeing.

HTH solutions containing 1,000 ppm available chlorine will reduce bacteria in pecans without affecting the taste. Prior to cracking and shelling, soak the pecans in the HTH solution for at least 10 minutes, then remove. Let the pecans age for 24 hours to allow for softening of the meat. After this period, the pecans will crack more uniformly and the entire nut may be removed more easily.

HTH solutions containing 5000 ppm available chlorine will effectively bleach pecan shells. Before bleaching, the pecans should be washed in a rotary cleaner. Wash, drain, and soak the pecans in a 2% sulfuric acid bath at a temperature of 27° to 32° C (80° to 90° F) for one minute. Then, place them in the HTH solution for four to eight minutes. After the pecans are bleached white, drain and wash in a 1% sulfuric acid bath at 27° to 32° C. They are then ready to be dyed, after drying.

Sugar Refineries

HTH® solutions, applied to sugar during the refining process, will control the bacteria that cause inversion, gums, slime and fermentation.

Dust Collector Bacteria: HTH solutions will control dust collector bacteria, to reduce sugar inversion significantly and eliminate slime completely.

The HTH solution containing 8% available chlorine should be fed continuously, by a gravity feed, into the recirculating low-concentration syrup in the dust collector. Adjust the feed so that the syrup leaving the dust collector contains a chlorine residual of 10 ppm.

HTH® is a registered trademark of Olin Corporation

HTH® DRY CHLORINATOR FOR FOOD PROCESSING

Gum-Forming Bacteria: Coating raw sugar with a low concentration of HTH solution will eliminate the gum-forming bacteria that can slow the filtration rate of syrup.

If possible, apply the HTH solution to raw sugar as it is spun in the centrifugals. If this is not practical, introduce the solution in the syrup tank.

Thermophilic Bacteria in Vacuum Pans: Thermophilic bacteria (those which flourish under high heat conditions) can multiply rapidly in vacuum pans.

Solutions containing one pound of HTH dry chlorinator for each ton of sugar (dry weight) will effectively control these bacteria. Just add the HTH solution directly to the boiling sugar in the vacuum pans.

How to Prepare Solutions of HTH® Dry Chlorinator[a]

Each of the applications listed above requires a specific concentration of solution, measured in parts per million (ppm) or percent of available chlorine. To prepare the proper strength solution follow these three simple steps:

1. Determine the volume[b] of the holding tank (in cubic feet or cubic inches).
2. Find the capacity of the tank in gallons. If the volume has been determined in cubic feet, use Formula (1). If the volume is in cubic inches, use Formula (2).
   (1) Gallons = 7.48 x Volume in cubic feet
   (2) Gallons = .0043 x Volume in cubic inches
3. Use Tables 1 or 2 to determine how many ounces of HTH dry chlorinator must be added to the number of gallons of water to obtain the required ppm or percent of available chlorine. (Never add HTH dry chlorinator to anything but water.) If the volume of water you're using does not appear in Tables 1 or 2, simply calculate between values.

Table 1

Required Amounts of HTH® Dry Chlorinator* (Pounds-Ounces)

Available Chlorine (ppm)	Water (Gallons)				
	10	50	100	500	1,000
10	—	0-1/10	0-1/5	0-1	0-2
25	—	0-1/4	0-1/2	0-3	0-5
50	0-1/10	0-1/2	0-1	0-6	0-11
100	0-1/5	0-1	0-2	0-11	1-5
200	0-2/5	0-2	0-4	1-5	2-10
1,000	0-2	0-11	1-5	6-8	13-0
5,000	0-11	3-5	6-8	32-10	65-3

Table 2

Required Amounts of HTH® Dry Chlorinator (Pounds-Ounces)

Available Chlorine (%)	Water (Gallons)				
	1	5	10	50	100
8	1-1	5-3	10-7	52-2	104-5

*For convenience in measuring small quantities 3 tablespoons of granular HTH equals approximately 1 ounce.

Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, rubber or PVC gloves and boots. Read label instructions before using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Toxicological Properties

The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and is not known to be a carcinogen.

Storage and Handling

Store in cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign material. Protect against physical damage. Drums may rupture if exposed to heat.

Spill and Leak Procedure

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use. (See Title 29, Section 1910.134, *Code of Federal Regulations.*) Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. In the event of a large spill call 203-356-2345.

Disposal

Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regula-

[a] Stock solutions should be freshly prepared and kept in properly labeled containers to protect against contamination. Unused stock solutions should be discarded.

[b] Volume of a rectangular tank: V = Length x Width x Height
Volume of a circular tank: V = 3.142 x Radius x Radius x Height
or
V = 0.785 x Diameter x Diameter x Height

tory agencies to ascertain proper disposal procedures.

Shipping Information

HTH® dry chlorinator is available in granular or tablet form in 100 lb. fiber drums.

Technical Assistance

Technical assistance is available to facilitate your further investigation of HTH® dry chlorinator. If you have a question or need more information, please call or write your nearest Olin Sales Office.

Keep HTH® out of reach of children. Danger. See principal label for complete precautionary information and storage and handling.

This bulletin and the information contained herein are offered solely for your consideration, investigation and verification. No representations or warranties, express or implied, of merchantability or otherwise, are made or contained herein. Olin's responsibility for any claims arising in connection herewith shall in no event exceed the purchase price or fair market value of the material. User may be responsible for compliance with all applicable Federal, state and local laws and regulations regarding the product and its storage and handling. Nothing contained herein shall be construed to constitute permission or a recommendation to practice any invention covered by a patent or patent application or know-how owned by Olin Corporation or by others.

The use of HTH® dry chlorinator for the purposes described in this bulletin has been registered with the United States Environmental Protection Agency, but may not have been approved or registered for use or sale for such purposes in other countries. Olin Corporation assumes no responsibility for compliance with the laws of any country except the United States.

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HTH® DRY CHLORINATOR FOR DISINFECTION OF FOOD HANDLING EQUIPMENT

Sanitization with HTH® dry chlorinator is an easy and effective way to destroy harmful bacteria that can contaminate food handling equipment. Treatment with HTH dry chlorinator throughout food handling operations can help insure the quality and safety of the final product.

Advantages of HTH® Dry Chlorinator

HTH dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

All commercial sanitizers sold for biocidal applications must be registered with the U.S. Environmental Protection Agency (EPA). Olin has produced HTH dry chlorinator for over 50 years and has obtained registration for many of these applications. Some of them are presented here, but if your specific needs are not included, contact your nearest Olin sales office. Additional data are on file, or we may be able to help you obtain the necessary government registrations.

Meat Processing Plants

Solutions of HTH® dry chlorinator will control odors and bacteria in meat processing plants, while serving as effective general sanitizers.

Killing Rooms: Disinfection of the entire killing room with HTH solutions will prevent the contamination of meat and the development of offensive odors.

First, scrub the walls and floors completely. Then spray thoroughly with an HTH solution containing 5000 ppm available chlorine.

All drains and traps which blood may pass through should be flushed thoroughly with water. Then flush again with an HTH solution containing 500 ppm available chlorine. Allow this solution to remain overnight, then remove.

Inedible Rooms: HTH solutions containing 1000 ppm available chlorine will properly sanitize inedible rooms, to prevent odors and improve the handling qualities of hides and other marketable items.

Inedible rooms should be thoroughly cleaned on a regular basis. After each cleaning, spray the tank house, the press rooms and the hide rooms generously with the HTH solution.

Edible Rooms: HTH solutions containing 1000 ppm available chlorine will control bacteria in edible rooms (refrigerating, curing and processing areas) to prevent taste and color problems in the products.

All edible rooms should be thoroughly cleaned on a regular basis. After each cleaning, all room surfaces and equipment should be sprayed well with the HTH solution. After spraying, wait 2 minutes, then rinse thoroughly with fresh water.

Equipment and Utensils: HTH solutions containing 200 ppm available chlorine will sanitize all equipment and utensils that come in contact with meat, to help prevent contamination.

Clean equipment and utensils thoroughly, removing all fat and grease. Spray or rinse with HTH solution. Wait two minutes, then rinse all metal surfaces with fresh water. For other surfaces, allow to drain or air dry before contacting food surfaces.

Locker Rooms, Elevator Pits and Toilets: HTH solutions containing 5000 ppm available chlorine will sanitize and deodorize locker rooms, elevator pits and toilets, to provide employees with uncontaminated facilities.

Locker rooms, shower rooms, toilets, urinals and drains should be cleaned and sprayed or flushed with the HTH solution on a regular basis. After treatment, wait 10 minutes and rinse exposed metal surfaces with clear water to prevent corrosion.

For toilet bowls, add 1 level tablespoon of HTH to the residual water and swab.

Laundry Department: All linens, clothing, cheesecloth, ham wrappings and other laundry items which may come in contact with the product should be disinfected with an HTH bleaching solution while being washed.

To prepare this solution: Stir 3¾ pounds of HTH dry chlorinator in a 30 gallon plastic container holding 10 gallons of warm water. Add 3 pounds of soda ash and mix thoroughly. Immediately before using, dilute the solution to 30 gallons.

When the wash wheel is in its second rinse, add 2 quarts of the bleaching solution for each 64 gallons of water (100 pounds dry load).

Dairy Plants

Solutions of HTH® dry chlorinator provide an effective, economical method of sanitizing processing equipment and problem areas in dairy plants.

To prevent contamination of the product, apply HTH solutions to every surface it will touch.

Pressure Method of Sanitizing Equipment: The pressure (or flow) method is commonly used to sanitize closed systems, such as fluid milk cooling and handling equipment. It's also appropriate for sanitizing weigh tanks, coolers, short time pasteurizers, pumps, homogenizers, fillers, sanitary piping and fittings, and bottle and can fillers.

First, clean all equipment thoroughly, immediately after it's used. Then place back in operating position.

HTH® DRY CHLORINATOR FOR FOOD HANDLING EQUIPMENT

Prepare sufficient volume of an HTH solution containing 200 ppm available chlorine to fill the equipment. Allow a 10% excess for waste.

Pump the HTH solution through the system until it is filled and all air is excluded. Close final drain valves and hold under pressure for two minutes to insure proper contact with all surfaces. Then drain the solution and flush with potable water.

Spray Method of Sanitizing Equipment: The spray (or fog) method is generally used to sanitize large, non-porous surfaces that have already been freed of physical soil. It is appropriate for batch pasteurizers, holding tanks, weigh tanks, tank trucks and cars, vats, tile walls, ceilings and floors.

Prepare an HTH solution containing 200 ppm available chlorine. If possible, use pressure spraying or fogging equipment designed to resist hypochlorite solutions (e.g. rubber-coated, plastic or stainless steel). When using any other kind of spraying equipment, be sure to empty and rinse thoroughly with fresh water immediately after treatment.

Apply spray or fog heavily to all surfaces the product will touch. All treated surfaces, corners and turns should be thoroughly sprayed. Allow excess solution to drain off, rinse with fresh water, then place in service.

General Disinfection: HTH solutions containing 1000 ppm available chlorine will sanitize plant floors, walls and ceilings, and also control odors in refrigerated areas and drain platforms.

Flush or swab surfaces generously with the HTH solution. After two minutes, hose or rinse all metal surfaces with fresh water.

Controlling Mold & Mildew: HTH solutions containing 5000 ppm available chlorine will destroy mold and non-residual mildew that often grows in cheese-aging rooms, storage rooms and other areas.

Brush or spray all walls, floors, ceilings and shelves with the HTH solution. Then rinse all metal surfaces immediately, to prevent corrosion.

Poultry Plants

Solutions of HTH® dry chlorinator will control odors and bacterial growth in poultry feeding and dressing plants.

Regular treatment with HTH solutions containing 5000 ppm available chlorine will sanitize poultry feeding areas, dropping boards, feeding troughs and watering fountains.

Dropping boards and feeding troughs should be sprayed or flushed thoroughly with the HTH solution.

All watering fountains should be rinsed with this solution.

In float control fountains, treat poultry drinking water with 1 ounce of HTH dry chlorinator for every 1000 to 5000 gallons of water by using a gravity feeder.

In refillable fountains, add 1 ounce of HTH dry chlorinator for every 1000 to 5000 gallons of poultry drinking water.

Poultry dressing areas should be cleaned regularly before treatment. Immediately after cleaning, spray the walls, tables, floors and ceilings with solutions of HTH dry chlorinator containing 5000 ppm available chlorine.

All cleaned equipment and utensils should be rinsed with HTH solutions containing 200 ppm available chlorine. After a contact period of two minutes, rinse all metal surfaces with clear water. For other surfaces, allow to drain or air dry before contacting food surfaces.

Fish Processing Plants

Solutions of HTH® dry chlorinator will control the growth of bacteria and microorganisms that often occur in fish processing plants.

Before treating with the HTH solution, scrub all surfaces thoroughly with hot water and washing powder to remove all soil.

Smooth Surfaces: HTH solutions containing 300 to 500 ppm available chlorine will sanitize smooth wood, metal or synthetic surfaces (new boxes, new tabletops, conveyor belts or machines). Wash surfaces with the HTH solution for two to five minutes. Wait two minutes, then rinse metal surface with fresh water.

Rough Surfaces: HTH solutions containing 1000 to 5000 ppm available chlorine will sanitize rough surfaces (worn tables, old boxes, concrete floors and walls). Wash surfaces with the HTH solutions for two to five minutes. Wait two minutes, then rinse metal surfaces with fresh water.

Sugar Refineries

General Sanitization: Solutions of HTH® dry chlorinator containing 500 ppm available chlorine will properly sanitize floors, pipes, tanks and other problem areas in sugar refineries.

All areas needing treatment should be rinsed and flushed with the HTH solution. Then rinse with potable water before exposing to edible products.

Sugar Bags: HTH solutions can eliminate certain types of bacteria on sugar bags that mere washing cannot. Proper use of HTH dry chlorinator during the washing process will thoroughly sanitize and deodorize sugar bags.

Prepare an HTH solution containing 1% available chlorine. Stir in ¾ pound of soda ash for each pound of HTH dry chlorinator and allow to settle.

Add this solution slowly to the bag washer. Five minutes after application, test for available chlorine. A chlorine residual of 50 ppm should remain in the wash water. If not, add more solution, wait five minutes and test again, until a residual of 50 ppm is indicated.

Restaurant Utensils

Solutions of HTH® dry chlorinator containing 100 ppm available chlorine will kill bacteria on dishes, glasses and other eating utensils.

Fresh HTH solutions should be prepared each morning and as frequently as necessary during the day. Cold or warm water may be used. The solution should never be allowed to fall below 50 ppm available chlorine.

Small quantities of this solution can be prepared by adding 1 level teaspoon of HTH dry chlorinator to 5 gallons of water, or 1 level tablespoon of HTH dry chlorinator to 15 gallons of water. (Be sure to use a spoon that is completely dry and clean.) For larger quantities, consult Table 1 in the next section.

Before treatment, clean all utensils thoroughly. Then immerse them in the HTH solution.

How to Prepare Solutions of HTH® Dry Chlorinator*

Each of the applications listed above requires a specific concentration of solution, measured in parts per million (ppm)

*Stock solutions should be freshly prepared and kept in properly labeled containers to protect

or percent of available chlorine. To prepare the proper strength solution follow these three simple steps:

1. Determine the volume[b] of the holding tank (in cubic feet or cubic inches).
2. Find the capacity of the tank in gallons. If the volume has been determined in cubic feet, use Formula (1). If the volume is in cubic inches, use Formula (2).
   (1) Gallons = 7.48 x Volume in cubic feet
   (2) Gallons = .0043 x Volume in cubic inches
3. Use Tables 1 or 2 to determine how many ounces of HTH dry chlorinator must be added to the number of gallons of water to obtain the required ppm or percent of available chlorine. (Never add HTH dry chlorinator to anything but water.) If the volume of water you're using does not appear in Tables 1 or 2 you may calculate between values.

Table 1
Required Amounts of HTH® Dry Chlorinator* (Pounds-Ounces)

Available Chlorine (ppm)	Water (Gallons) 10	50	100	500	1,000
100	0-2/10	0-1	0-2	0-11	1-5
200	0-4/10	0-2	0-4	1-5	2-10
300	0-6/10	0-3	0-6	2-0	3-15
400	0-8/10	0-4	0-9	2-10	5-4
500	0-1	0-6	0-11	3-4	6-8
1,000	0-2	0-11	1-5	6-8	13-0
5,000	0-11	3-5	6-8	32-10	65-3

Table 2
Required Amounts of HTH® Dry Chlorinator (Pounds-Ounces)

Available Chlorine (%)	Water (Gallons) 1	5	10	50	100
1	0-2	0-11	1-5	6-8	13-0

*For convenience in measuring small quantities 2 teaspoons of granular HTH equals approximately ¼ ounce.

Storage and Handling

Store in a cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign material. Protect against physical damage. Drums may rupture if exposed to heat.

[b]Volume of a rectangular tank: V = Length x Width x Height
Volume of a circular tank: V = 3.142 x Radius x Radius x Height
or
V = 0.785 x Diameter x Diameter x Height

Toxicological Properties

The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and is not known to be a carcinogen.

Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, rubber or PVC gloves and boots. Read label instructions before using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Spill and Leak Procedures

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use. (See Title 29, Section 1910.134, *Code of Federal Regulations*.) Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. In the event of a large spill call 203-356-2345.

Disposal

Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regulatory agencies to ascertain proper disposal procedures.

Shipping Information

HTH® dry chlorinator is available in granular or tablet form in 100 lb. fiber drums.

Technical Assistance

Technical assistance is available to facilitate your further investigation of HTH® dry chlorinator. If you have a question or need more information, please call or write your nearest Olin Sales Office.

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Under the Federal
as amended for
registered under
EPA Reg. No. 1258-1069

Keep HTH® out of reach of children. Danger. See principal label for complete precautionary information and storage and handling.

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Sales Offices

Atlanta, GA 30328–1140 Hammond Dr., Suite 6150, (404) 394-5820
Deerfield Beach, FL 33441–700 W. Hillsboro Blvd., Suite 203, (305) 426-0101
Charlotte, NC 28280–1 NCNB Plaza, Suite 3505, (704) 373-1681
Cincinnati, OH 45242–8150 Corporate Park Dr., Suite 210, (513) 489-7990
Houston, TX 77027–4550 Post Oak Place Dr., Suite 221, (713) 960-0610
Oak Brook, IL 60521–2301 W. 22nd St., Suite 209, (312) 325-2280
Orange, CA 92668–500 S. Main St., Suite 910, No. Tower, (714) 558-9101
St. Louis, MO 63105–7777 Bonhomme Ave., Suite 1908, (314) 862-6705
Stamford, CT 06901–3 Landmark Square, Suite 205, (203) 356-3000
Wayne, PA 19087–997 Old Eagle School Rd., Suite 208, (215) 293-0990
International Sales–120 Long Ridge Rd., Stamford, CT 06904, (203) 356-2000

OLIN CHEMICALS

HTH® DRY CHLORINATOR FOR PURIFICATION OF WATER

Sanitization with HTH® dry chlorinator is an easy and effective way to destroy harmful bacteria that can contaminate public, private and industrial water supplies.

Water used for drinking or processing foods and beverages must be sanitized to prevent a serious health hazard.

Advantages of HTH® Dry Chlorinator

HTH dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

All commercial sanitizers sold for biocidal applications must be registered with the Environmental Protection Agency (EPA). Olin has produced HTH dry chlorinator for over 50 years and has obtained registration for many of these applications. Some of them are presented here, but if your specific needs are not included contact your nearest Olin Sales Office. Additional data are on file or we may be able to help you obtain the necessary registration.

In all of the applications below, HTH dry chlorinator can be used to purify water supplies. Be sure to comply with all Federal, state and local regulations for water purification.

Water Works

Chlorination with HTH® dry chlorinator is an effective, economical way to purify water supplies and make them safe for human consumption.

In most cases, HTH solutions applied to a residual of 0.1 to 0.2 ppm, after a minimum contact period of 20 minutes, will destroy most bacteria and other organic matter present in the water. Then more HTH dry chlorinator must be added to maintain the proper chlorine residual.

HTH solutions are usually fed into the water supply by a hypochlorinator. When a uniform rate of flow is maintained, a constant-rate hypochlorinator should be used. If the flow rate varies, a proportional-feeding hypochlorinator will be more effective. If the application or volume does not warrant the use of a hypochlorinator, gravity or siphon feeds may be used to introduce the HTH solution.

The solution should be applied at a point along the flow which provides thorough mixing 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 storage tank. If it's not possible to use either of these locations, HTH solutions may be applied at any spot where enough turbulence exists to guarantee sufficient mixing and contact time.

To make sure that the proper chlorine residual (0.1 to 0.2 ppm) is always present, initiate a regular testing routine.

HTH Dry Chlorinator for Emergency Use: For water plants that don't have stand-by gas chlorinating equipment, hypochlorination with HTH dry chlorinator is an inexpensive way to protect water supplies during an emergency.

When equipment failure occurs, plant personnel can apply HTH solutions promptly and efficiently at any point in the distribution system by using portable hypochlorinators.

If mechanical hypochlorinators are available, they should be placed where the HTH solution will mix thoroughly with the entire volume of water to be treated.

If no hypochlorinators are available, set up a gravity feed at a convenient spot. Adjust the flow of HTH solution into the water supply so it maintains a minimum normal dosage under maximum demand conditions. When demand or pumping fluctuates widely, monitor the gravity feeders carefully to insure uniform dosage at all times.

Private Water Supplies

All private water supplies beyond the limits of the public distribution system require adequate purification to be safe for human consumption. Included are wells, natural springs, cisterns and storage tanks.

Manual Treatment: When relatively small quantities of water must be purified, HTH® dry chlorinator, in its granular form, may be applied directly.

For the initial chlorine dosage, add the proper amount of HTH dry chlorinator to provide the water with approximately 1 ppm available chlorine (see Table 1).

Stir water slightly and let it stand for at least 20 minutes. Then test for chlorine residual. If a residual of 0.2 ppm is not present, repeat the procedure until this level is obtained.

For routine chlorination, add the required amount of HTH dry chlorinator to provide the water with approximately 0.5 ppm available chlorine.

Maintain a chlorine residual of at least 0.2 ppm at all times. Test water at least once a day.

Continuous Treatment: Private water supplies serving single homes or small establishments may be easily protected by applying HTH solutions with small hyochlorinators or gravity feeders.

HTH solutions containing 1 or 2% available chlorine should be prepared in a polyethylene or earthenware container. Add HTH dry chlorinator, in its granular form, to the water while

HTH® DRY CHLORINATOR FOR PURIFICATION OF WATER

stirring with a clear wooden or plastic paddle. Let the small amount of insolubles settle to the bottom of the container.

Place the plastic suction intake line and filter above the settled insolubles. Then feed the solution into the intake side of the pump to allow for sufficient mixing and contact time before it reaches the gravity or pressure storage tank.

A residual of about 0.2 ppm, after a 20 minute contact period, will indicate that the water has been properly sanitized. This residual should be maintained to keep water from becoming contaminated.

Large estates, summer camps and resorts may purify their water supplies simply and inexpensively by adding HTH solutions with a small hypochlorinator.

Prepare an HTH solution containing 1 or 2% available chlorine according to the procedure outlined earlier. Feed the solution directly into the suction side of the pump delivering water to the gravity or pressure storage tank. If a constant speed pump operated by a float valve or pressure device is used, best results will be achieved by connecting a constant feed type hypochlorinator to the pump, so both may operate simultaneously.

Specific treatment requirements should be determined by submitting water samples to a reliable laboratory on a regular basis. In most cases, a 0.2 ppm residual after a 20 minute contact period will indicate adequate purification.

Treatment of Industrial Water Supplies

Canneries: Solutions of HTH® containing 1% available chlorine will effectively purify the water supply in canneries.

The HTH solutions should be fed into the water supply by a hypochlorinator on the intake side of the pump. An available chlorine residual of 0.1 to 0.2 ppm must be maintained throughout the water distribution system to assure adequate purification. A regular testing program should be initiated to make sure that the proper chlorine residuals are present at all times.

Carbonated Beverage Plants: HTH solutions containing 1% available chlorine will properly sanitize plant water used in the production of carbonated beverages.

The HTH solution should be introduced into the water supply by a hypochlorinator. An available chlorine residual of 0.1 to 0.2 ppm must be maintained throughout the system at all times. Be sure to dechlorinate the water before using it to process beverages.

Dairy Plants: HTH solutions containing 1% available chlorine will disinfect and purify water supplies in dairy plants, to help safeguard the quality of the final product. A solution of sodium hypochlorite is most commonly used. This solution should be prepared using the following procedure:

Stir 3¼ pounds of HTH dry chlorinator into a 30 gallon plastic container which is about ⅓ full of warm water. Then add 3 pounds of light soda ash, stir thoroughly and dilute to 30 gallons. Introduce this solution to the water supply and allow 20 minutes contact time. If a free available chlorine residual of 0.2 ppm is present, the water supply has been adequately sanitized.

How to Prepare Solutions of HTH® Dry Chlorinator [a]

Each of the applications listed above requires a specific concentration of solution, measured in parts per million (ppm) or percent of available chlorine. To prepare the proper strength solution follow these three simple steps:

1. Determine the volume[b] of the holding tank (in cubic feet or cubic inches).
2. Find the capacity of the tank in gallons. If the volume has been determined in cubic feet, use Formula (1). If the volume is in cubic inches, use Formula (2).
   (1) Gallons = 7.48 x Volume in cubic feet
   (2) Gallons = .0043 x Volume in cubic inches
3. Use Tables 1 or 2 to determine how many ounces of HTH dry chlorinator must be added to the number of gallons of water to obtain the required ppm or % of available chlorine. (Never add HTH dry chlorinator to anything but water.) For a volume of water that does not appear in Table 1 or 2, simply calculate between values.

Table 1
Required Amounts of HTH® Dry Chlorinator* (Pounds-Ounces)

Available Chlorine (%)	Water (Gallons) 1	5	10	50
1	0-2	0-11	1-5	6-8
2	0-4	1-5	2-10	13-0

*For convenience in measuring small quantities, 3 tablespoons of granular HTH equals approximately 1 ounce.

Table 2
Required Amounts of HTH® Dry Chlorinator (Teaspoons)

Available Chlorine (ppm)	Water (Gallons) 150	300	440	600	880	1200
0.5	⅛	¼	⅜	½	¾	1
1.0	¼	½	¾	1	1½	2

Storage and Handling

Store in cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign material. Protect against physical damage. Drums may rupture if exposed to heat.

Toxicological Properties

The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is

[a] Stock solutions should be freshly prepared and kept in properly labeled containers to protect against contamination. Unused stock solutions should be discarded.

[b] Volume of a rectangular tank: V = Length x Width x Height
Volume of a circular tank: V = 3.142 x Radius x Radius x Height
or
V = 0.785 x Diameter x Diameter x Height

less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and is not known to be a carcinogen.

Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, rubber or PVC gloves and boots. Read label instructions before using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Spill and Leak Procedures

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use (see Title 29, Section 1910.134, *Code of Federal Regulations*). Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. Wash all contaminated clothing before reuse. In the event of a large spill call 203-356-2345.

Disposal

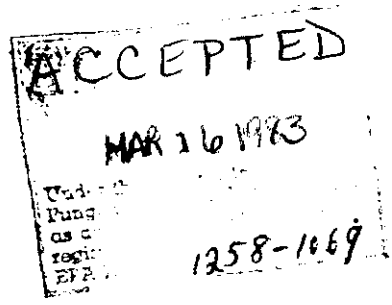
Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regulatory agencies to ascertain proper disposal procedures.

Shipping Information

HTH® dry chlorinator is available in granular or tablet form in 100 lb. fiber drums.

Technical Assistance

Technical assistance is available to facilitate further investigation of HTH® dry chlorinator. If you have a question or need more information, please call or write your nearest Olin Sales Office.



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HTH® DRY CHLORINATOR FOR INDUSTRIAL BLEACHING

Treatment with HTH® dry chlorinator is an easy and effective way to bleach colored broke in papermaking plants and dyeing drums used in tanneries.

Bleaching leftover colored broke for immediate reuse can eliminate expensive baling and warehousing costs, reduce the need for fresh pulp and increase efficiency in papermaking plants.

In tanneries, wooden drums used in dyeing leather must also be bleached properly before reusing.

Advantages of HTH® Dry Chlorinator

HTH dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

Papermaking Industry

In general, HTH® dry chlorinator is an effective bleaching agent for all the common paper dyes. To be sure that a particular dye is bleachable with HTH solutions, the dye must either be identified properly or tested for bleachability.

How to Identify Dyes: In all, about 100 different types of dyestuffs are used for coloring paper. But every manufacturer has its own name for each generic dye — resulting in thousands of different trade names.

A comprehensive, two-volume *Colour Index Directory* is published by the American Association of Textile Chemists and Colorists (AATCC), providing a cross-reference of generics and trade names. Volume 1 lists dyes generically, each with a colour index number that corresponds to every trade name for that particular dye, to be found in Volume 2. So if the generic type is known, all trade names can be found, and vice versa.

Figure 1 lists some of the common generic paper dyes which can be bleached with HTH dry chlorinator. (Listings appear just as they do in the AATCC *Colour Index*.)

How to Test For Bleachability: When dyes in colored broke are unidentified, the following simple test will determine whether or not HTH dry chlorinator will be an effective bleaching agent.

Make up a small quantity of 3% HTH solution and add a few handfuls of broke. If all color is destroyed (even in mixed color batches), the entire batch should bleach out when treated with HTH dry chlorinator.

The Bleaching Process: Quantities of water and HTH dry chlorinator necessary for effective bleaching should be determined by the dry weight of the broke to be processed. As a rule, the available chlorine content of solutions should be about 2% of the dry broke weight.

Example: 2500 pounds of broke will require 50 pounds (2500 x .02) of available chlorine. And since HTH dry chlorinator contains 65% available chlorine, 77 pounds (50 ÷ .65) of it will be required to deliver the proper amount of chlorine.

To assure the proper consistency of the final pulp, the weight of the dry broke should be 5 to 6% of the total weight of the broke and water. To attain this consistency use 2 gallons of water for every pound of dry broke. Thus, to bleach 2500 pounds of dry broke 5,000 gallons of water will be needed.

Ideally, HTH dry chlorinator should be introduced as a solution through a perforated pipe or sparger arrangement. Otherwise, it should be added evenly with a clean, stainless steel scoop. Do not handle HTH dry chlorinator with bare hands.

Storable stock solutions prepared in volume should contain 10 pounds of HTH dry chlorinator for every 26 gallons of water. Make sure mixing water is warm. Store the stock solution in plastic containers.

If a solution is used, benchmark proportions for the full charge should be adjusted, as follows, to account for the water added with the HTH dry chlorinator:

250 pounds dry broke
480 gallons water
20 gallons HTH stock solution

The actual bleaching process can be accomplished in a conventional pulping unit. To prepare the bleach run, add the proper amount of water required by the dry broke weight and heat to 140°F. (If water is too cool, the solution will not activate properly. Under 70°F, bleaching may not occur.)

Once the water is heated, broke should be added and pulped. HTH dry chlorinator, either in solution or dry, should then be introduced as quickly and evenly as possible during the beating cycle.

If colors are relatively light or weak, the proportion of HTH dry chlorinator to dry broke weight may be reduced. Experience will dictate the most economical quantity to use in each

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HTH® DRY CHLORINATOR FOR INDUSTRIAL BLEACHING

Figure 1
Common Paper Dyes Bleachable With HTH®

Generic Name	Colour Index Number	Generic Name	Colour Index Number	Generic Name	Colour Index Number
Acid red		Basic orange		Direct blue	
14	14720	2	11270	6	22610
88	15620			14	23850
27	16185	Acid yellow		8	24140
18	16255	36	13065	1	24410
1	18050	3	47005	Basic blue	
73	27290	2	47010	26	44045
Direct red		Direct yellow		9	52015
20	15075	4	24890	Acid violet	
28	22120			17	42650
17	22150	Basic yellow		Basic violet	
37	22240	2	41000	1	42535
1	22310			23	42555
2	23500	Acid green		5	50205
75	25380	3	42085	Direct brown	
81	28160	9	42100	2	22311
23	29160			1	30045
		Direct green		6	30140
Basic red		6	30295		
1	45160			Basic brown	
2	50240	Basic green		1	21000
		4	42000	Acid black	
Acid orange		1	42040	1	20470
7	15510			2	50420
8	15575	Acid Blue			
		22	42755	Direct black	
Direct orange		45	63010	38	30235
8	22130				

case. It is useful to log actual proportions by color, so that future batches of the same or similar shades can be treated routinely.

If necessary, the final step in the bleaching process is to reduce the pH of the pulped mixture to 5 or 6. At the end of the beating cycle, use 0.5% sodium acid sulfate (nitre cake) or dilute sulfuric acid. (Do not use alum, since it tends to set extraneous foreign matter on the pulp.)

Pulp bleached with HTH dry chlorinator is often reused without draining or washing. However, draining reduces residual matter which may discolor the pulp. And washing ensures an even brighter, cleaner product.

Because the free chlorine from HTH dry chlorinator is almost completely consumed in the bleaching process, no antichlors (e.g. sodium bisulfate) need be added at any point in the procedure.

Tanneries

HTH® dry chlorinator, as a bleaching agent, is quite effective in removing coloring matter from wooden drums used in the dyeing of leather. An HTH solution containing 1-3% available chlorine is recommended.

First, clean the drum in the usual manner. Then, for each 100 gallons of drum capacity, add 10 gallons of water at 150-180°F.

Use Table 1 to determine how much HTH dry chlorinator is required. Then use 1 gallon of warm water to dissolve each pound of HTH dry chlorinator.

Add this warm bleach solution to the dye drum and agitate for 25 to 30 minutes longer. Be sure the solution makes complete contact with all the drum parts to remove color thoroughly.

Table 1
Required Amounts of HTH® Dry Chlorinator*
(Pounds-Ounces)

Available Chlorine (%)	Water (Gallons) 1	5	10	50
1	0-2	0-11	1-5	6-8
2	0-4	1-5	2-10	13-0
3	0-7	1-15	3-15	19-9

*For convenience in measuring small quantities, 3 tablespoons of granular HTH equals approximately 1 ounce.

How to Prepare Solutions of HTH® Dry Chlorinator[a]

Each of the applications listed above requires a specific concentration of solution, measured in percent of available chlorine. To prepare the proper strength solution follow these three simple steps:

1. Determine the volume[b] of the holding tank (in cubic feet or cubic inches).
2. Find the capacity of the tank in gallons. If the volume has been determined in cubic feet, use Formula (1). If the volume is in cubic inches, use Formula (2).
   (1) Gallons = 7.48 x Volume in cubic feet
   (2) Gallons = .0043 x Volume in cubic inches
3. Use Table 1 to determine how many ounces of HTH dry chlorinator must be added to the number of gallons of water to obtain the required % of available chlorine. (Never add HTH dry chlorinator to anything but water.) For a volume of water that does not appear in Table 1, simply calculate between values.

Storage and Handling

Store in cool, dry, well ventilated place away from combustible materials, and avoid contamination with any foreign material. Protect against physical damage. Drums may rupture if exposed to heat.

Toxicological Properties

The acute oral LD_{50} (rat) is 850 mg/kg. The acute dermal LD_{50} (rabbit) is greater than 2 g/kg. The acute inhalation LC_{50} is less than 20 mg/l and greater than 2 mg/l of inspired air for one hour (rat). HTH® dry chlorinator is corrosive to the skin and eyes. It was not found to be a mutagen in the Ames assay and is not known to be a carcinogen.

Personnel Protection

HTH® dry chlorinator is easy to handle and use. As with any chemical, however, certain precautions should be taken. Do not get in eyes, on skin or on clothing. Avoid breathing dust. Do not take internally. Wear goggles, coveralls and neoprene, rubber or PVC gloves and boots. Read label instructions before using product.

First Aid

Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

Skin Contact: Flush with water for 15 minutes. Call a physician.

Eye Contact: Flush with water for 15 minutes. Call a physician.

Inhalation: Remove victim to fresh air. Call a physician.

Spill and Leak Procedures

Remove all sources of ignition. Wear a NIOSH/MSHA approved dust and chlorine respirator. Follow OSHA regulations for respirator use (see Title 29, Section 1910.134, *Code of Federal Regulations*). Wear goggles, coveralls and rubber, neoprene or PVC gloves and boots. Clean up in a manner to minimize contamination with organic material. Do not return spilled material to original container. Place in a fresh container and isolate outside or in a well ventilated area. Do not seal the container. Flush any residual material with large quantities of water. Wash all contaminated clothing before reuse. In the event of a large spill call 203-356-2345.

Disposal

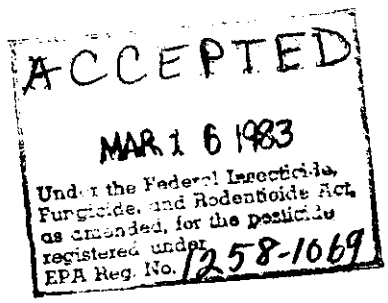
Dispose of unused product in a manner approved for this material. Consult appropriate Federal, state and local regulatory agencies to ascertain proper disposal procedures.

Shipping Information

HTH® dry chlorinator is available in granular or tablet form in 100 lb. fiber drums.

Technical Assistance

Technical assistance is available to facilitate further investigation of HTH® dry chlorinator. If you have a question or need more information, please call or write your nearest Olin Sales Office.



[a]Stock solutions should be freshly prepared and kept in properly labeled containers to protect against contamination. Unused stock solutions should be discarded.

[b]Volume of a rectangular tank:
V = Length x Width x Height
Volume of a circular tank:
V = 3.142 x Radius x Radius x Height
or
V = 0.785 x Diameter x Diameter x Height

Keep HTH® out of reach of children. Danger. See principal label for complete precautionary information and storage and handling.

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The use of HTH® dry chlorinator for the purposes described in this bulletin has been registered with the United States Environmental Protection Agency, but may not have been approved or registered for use or sale for such purposes in other countries. Olin Corporation assumes no responsibility for compliance with the laws of any country except the United States.

Sales Offices

Atlanta, GA 30328–1140 Hammond Dr., Suite 6150, (404) 394-5820
Deerfield Beach, FL 33441–700 W. Hillsboro Blvd., Suite 203, (305) 426-0101
Charlotte, NC 28280–1 NCNB Plaza, Suite 3505, (704) 373-1681
Cincinnati, OH 45242–8150 Corporate Park Dr., Suite 210, (513) 489-7990
Houston, TX 77027–4550 Post Oak Place Dr., Suite 221, (713) 960-0610
Oak Brook, IL 60521–2301 W. 22nd St., Suite 209, (312) 325-2280
Orange, CA 92668–500 S. Main St., Suite 910, No. Tower, (714) 558-910
St. Louis, MO 63105–7777 Bonhomme Ave., Suite 1908, (314) 862-6705
Stamford, CT 06901–3 Landmark Square, Suite 205, (203) 356-3000
Wayne, PA 19087–987 Old Eagle School Rd., Suite 208, (215) 293-0990
International Sales–120 Long Ridge Rd., Stamford, CT 06904, (203) 356-2000

OLIN CHEMICALS

010-022R

HTH® DRY CHLORINATOR FOR SANITIZING WATER IN CLINICAL POOLS AND TANKS

Sanitization with HTH® dry chlorinator is an easy and effective way to disinfect water in hydrotherapy pools and immersion tanks used by hospitals and clinics.

Advantages of HTH® Dry Chlorinator

HTH dry chlorinator, which contains 65% available chlorine, is a granular or tablet form of calcium hypochlorite, one of the most effective sanitizers known. It is convenient, easy to use and handle, doesn't require complex, expensive metering equipment or large storage tanks, and doesn't lose strength rapidly during storage.

All commercial sanitizers sold for biocidal applications must be registered with the U.S. Environmental Protection Agency (EPA). Olin has produced HTH dry chlorinator for over 50 years and has obtained registration for many of these applications. Some of them are presented here, but if your specific needs are not included, contact your nearest Olin sales office. Additional data are on file, or we may be able to help you obtain the necessary government registrations.

Hydrotherapy Pools

HTH® dry chlorinator, in its granular form, will provide effective disinfection of water in hydrotherapy pools.

Do not handle HTH dry chlorinator with your bare hands. Use gloves or thoroughly clean, dry utensils.

For initial chlorination, add 1 ounce of granular HTH dry chlorinator for every 1,000 gallons of water in the pool.

Allow 5 minutes for granules to dissolve, then test for available chlorine. If the residual is less than 1.0 ppm, repeat the dosage until 1.0 ppm is obtained.

No one should enter the pool until the chlorine residual is between 1.0 and 3.0 ppm.

Once the initial chlorination has been accomplished, the routine dosage should be 0.5 ounce of HTH dry chlorinator for every 1,000 gallons of water in the pool.

This dosage should be applied daily, or as often as necessary, to maintain a residual of 1.0 ppm, whether the pool is in use or not.

Be sure to keep the pH level of the water between 7.2 and 7.6. Maintaining the proper chlorine residual and pH level will provide you with clean, sparkling water.

Operate the pool filter continuously to maintain water purity. Drain the tank every week and scrub with a phenolic germicidal detergent. Then rinse well before refilling with water.

Hubbard and Immersion Tanks

HTH® dry chlorinator, in its granular form, will effectively disinfect water in Hubbard and immersion tanks.

Before the patient enters, add 0.5 ounce of granular HTH dry chlorinator for every 100 gallons of water in the tank. This treatment should leave a chlorine residual of about 25 ppm.

Check to be sure that the pH level is between 7.2 and 7.6. Then the patient may enter.

When the patient leaves, drain the tank and clean all inside surfaces with a germicidal detergent. Refill tank with water for next patient.

After the last patient of each day has been treated, add 0.5 ounce of granular HTH dry chlorinator to a clean bucket filled with tap water. Circulate this solution through the agitator of the tank for 15 minutes and rinse out.

Then clean the tank thoroughly with a germicidal detergent, rinse, and wipe dry with clean cloths.

Personnel Protection

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Ingestion: Give bread soaked in milk, followed by large amounts of water. If person is conscious and vomiting, place face down with head lower than hips. Get immediate medical attention.

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HTH® DRY CHLORINATOR FOR CLINICAL POOLS AND TANKS

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