

86054-1

12/08/2009

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY



U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Pesticide Programs
Antimicrobials Division (7510P)
1200 Pennsylvania Avenue NW
Washington, D.C. 20460

EPA Reg. Number: 86054-1

Date of Issuance: DEC - 8 2009

Term of Issuance: Conditional

Name of Pesticide Product: TwinOxide COMPONENT A

NOTICE OF PESTICIDE:

[x] Registration
Reregistration

(under FIFRA, as amended)

Name and Address of Registrant (include ZIP Code):

TwinOxide International BV
De Tongelreep 17
NL-5684 PZ Best
(The Netherlands)

Note: Changes in labeling differing in substance from that accepted in connection with this registration must be submitted to and accepted by the Antimicrobials Division prior to use of the label in commerce. In any correspondence on this product always refer to the above EPA registration number.

On the basis of information furnished by the registrant, the above named pesticide is hereby registered/reregistered under the Federal Insecticide, Fungicide and Rodenticide Act. Registration is in no way to be construed as an endorsement or recommendation of this product by the Agency. In order to protect health and the environment, the Administrator, on his motion, may at any time suspend or cancel the registration of a pesticide in accordance with the Act. The acceptance of any name in connection with the registration of a product under this Act is not to be construed as giving the registrant a right to exclusive use of the name or to its use if it has been covered by others.

This product (OPP Decision No. D-409012) is registered in accordance with FIFRA sec 3(c)(7)(A) provided that you:

- 1. Submit and/or cite all data required for registration of your product under FIFRA sec. 3(c)(5) when the Agency requires all registrants of similar products to submit such data; and submit acceptable responses required for re-registration of your product under FIFRA section 4.
2. Make the labeling changes listed below before you release the product for shipment:
a. Revise the "EPA File Symbol to read, "EPA Reg. No. 86054-1".

Signature of Approving Official:

Wanda Y. Henson

Wanda Y. Henson
Acting Product Manager Team-32
Regulatory Management Branch II
Antimicrobials Division (7510P)

Date:

DEC - 8 2009

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CONCURRENCES

Table with columns for SYMBOL, SURNAME, and DATE, used for recording official concurrences.

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b. Remove the "Danger" from the heading "Hazards to Humans and Domestic Animals."

c. Revise the "Hazards to Humans and Domestic Animals" to add "Danger."

**"DANGER. Dry Ingredients: Corrosive.** Causes irreversible eye damage and skin burns. . ."

d. The heading "For Hard, Non-Porous Surfaces" appears to be a disinfectant claim. Revise the heading to explain the purpose for hard non-porous surfaces use directions.

e. Separate the cleaning instructions under "Domestic Applications" from the pesticidal use directions.

f. Separate the "Toilet Bowl" use directions from the Domestic Applications section of the label.

g. Remove the following chemicals from **Barns, Stables, Poultry houses, etc.** use directions: Phenolics, cresylic acid and pine oils.

h. The reference to "Black Mold" is not acceptable for this product and has been removed from the label.

i. The directions for use under "Enoculture and Viticulture" which includes information on both sanitization and disinfection must be separated with clear directions for use.

j. The Special Instructions are not acceptable for this label which does not have a claim against Human Immunodeficiency Virus. The information has been removed from the label.

k. You must revise the Storage and Disposal directions for the container disposal per PR-Notice 2007-4.

3. Submit three (3) copies of your final printed labeling before distributing or selling the product bearing the revised labeling.

If these conditions are not complied with, the registration will be subject to cancellation in accordance with FIFRA sec. 6(e). Your release for shipment of the product constitutes acceptance of these conditions.

CONCURRENCES

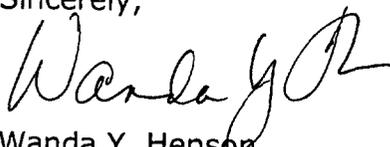
SYMBOL							
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A stamped copy of the label is enclosed for your records.

Sincerely,



Wanda Y. Henson  
Acting Product Manager 32  
Regulatory Branch II  
Antimicrobials Division (7510P)

Enclosures: (Stamped Label)

CONCURRENCES

CONCURRENCES							
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**TwinOxide® COMPONENT "A"**  
(Only to be used with TwinOxide® COMPONENT "B" for production of  
TwinOxide® Chlorine Dioxide 0.3% Solution)

**DISINFECTANT/SANITIZER  
FUNGISTATIC/ALGAESTATIC & MILDEWSTATIC**

When used as directed, this dual powder, chlorine dioxide-generating product is proven effective as: a  
Deodorizer, fungistat, mildewstat, algaestat *and sanitizer*

**KEEP OUT OF REACH OF CHILDREN**

**DANGER**

(See technical bulletin for other cautions)

Active Ingredient:

Sodium Chlorite:.....	64.0%
Other Ingredients:.....	36.0%
Total:.....	100.0%

**Amount of Chlorine Dioxide generated = 0.3% using amount of water identified on package**

<b>FIRST AID</b>
<b>If in Eyes:</b> Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
<b>If on Skin or Clothing:</b> Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
<b>If Swallowed:</b> Call poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.
<b>If Inhaled:</b> Remove victim to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for treatment advice. Get medical attention.
<b>HOT LINE NUMBER</b> Have the product container or label with you when calling the poison control center or doctor, or going for treatment. You may contact 1-800-424-9300 for emergency medical treatment information.

*NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage.*

**PRECAUTIONARY STATEMENTS** *→ DANGER*

**~~DANGER~~ - HAZARDS TO HUMANS & DOMESTIC ANIMALS:** (Dry ingredients: Corrosive. Causes irreversible eye damage and causes skin burns. Do not get in eyes or on clothing. May be fatal if swallowed. Wear chemical resistant gloves. Wear protective eyewear (goggles, face shield or safety glasses) when handling dry ingredients. Wear coveralls worn over long-sleeved shirt and long pants. Chemical-resistant footwear and socks must be worn. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove contaminated clothing and wash before reuse. Activated solution: May be fatal if swallowed. Do not get in the eyes or on clothing. Avoid contact with skin. Avoid breathing vapors. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. People must vacate the premises during fogging treatments; a one-hour restricted entry interval (REI) is required.

**ENVIRONMENTAL HAZARDS** This product is toxic to fish, aquatic invertebrates, oysters, and shrimp. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

**ACCEPTED  
with COMMENTS  
in EPA Letter Dated:**

DEC - 8 2009

Under the Federal Insecticide,  
Fungicide, and Rodenticide Act as  
amended, for the pesticide,  
registered under EPA Reg. No. *86054-1*

**PHYSICAL OR CHEMICAL HAZARDS** Dry sodium chlorite is incompatible with acids, reducing agents, combustible materials, sulfur-containing rubber, solvents and paints. Keep GO2™ solution from light and heat. Chlorine dioxide gas may concentrate in open space of container after both powders have been added to the starting water. Always dilute activated product in a well-ventilated area.

**NOTE:** For use in the institutional or commercial applications discussed below. Not for residential use or where young children may be present.

**STORAGE AND DISPOSAL**

DO NOT CONTAMINATE WATER, FOOD OR FEED BY STORAGE AND DISPOSAL. STORE IN COOL, DRY, VENTILATED AREA. STORE BELOW 50° C (122° F). DO NOT FREEZE. KEEP PRODUCT OUT OF DIRECT SUNLIGHT. STORE SEPARATELY FROM WATER AND ACIDS IF THIS PRODUCT CANNOT BE USED ACCORDING TO LABEL INSTRUCTIONS, CONTACT YOUR STATE PESTICIDE OR ENVIRONMENTAL CONTROL AGENCY, OR THE HAZARDOUS WASTE REPRESENTATIVE AT THE NEAREST EPA REGIONAL OFFICE FOR GUIDANCE. PR-Notice 2007-4

**WARRANTY STATEMENT:** The Company warrants the product to be free from defects in material and workmanship. THE COMPANY MAKES NO WARRANTY THAT THE GOODS SHALL BE MERCHANTABILITY. THE COMPANY MAKES NO WARRANTY, EXPRESSED OR IMPLIED, EXCEPT SUCH AS IS EXPRESSLY SET FORTH HEREIN. The Company shall not be liable for any incidental or consequential damages for any breach of warranty. The Company's liability for any breach of warranty shall be limited to the purchase price of the product.

When used as directed, this product is an effective fungistat, algaestat, and mildewstat agent and general-purpose antimicrobial. For all applications, clean surfaces before using product. Apply by mop, sponge, fogger or sprayer, ensuring visible wetness for times specified for these applications, or apply through immersion or clean-in-place application. Wear a NIOSH/MHSA-approved respirator appropriate for chlorine dioxide when using a high-pressurized sprayer.

**DIRECTIONS FOR USE:** IT IS A VIOLATION OF FEDERAL LAW TO USE THIS PRODUCT IN A MANNER INCONSISTENT WITH THE LABELING. Contains a 0.3% oxidizing agent. Do not mix component powders together in dry form. Mix component powders only into water. Do not mix with vinegar, hydrochloric, nitric or acetic acid or cleaning agents.

1. Always read the material safety data sheet (MSDS) and follow the safety instructions.
2. Write down the date of preparation of the 0.3% concentrate stock solution on the label of the container. The container should be UV-proof, sealable, dark and resistant to oxidation.
3. Fill the container with the exact amount of tap water shown on the label (1L, 5L, 10L, etc).
4. Check the temperature table. Temperature should be at least 68° F (20° C).
5. First add COMPONENT A to the container with water.
6. Then add COMPONENT B to the container.
7. Securely close the container. DO NOT SHAKE OR STIR AT THIS TIME.
- 8 Wait according to timetable below.
9. Shake or stir the solution gently with a non-metal instrument; beware of ClO<sub>2</sub> gas release.
10. TwinOxide® 3,000 ppm stock solution is ready for use.
11. TwinOxide® stock solution has a shelf life of approximately 30 days.
12. Store in a cool and dark place.
13. Wear a NIOSH/MHSA-approved respirator appropriate for chlorine dioxide.

REACTION TIME	WATER TEMPERATURE
≥ 1 HR	40°C (104°F)
≥ 3 HRS	30°C (86°F)
≥ 6 HRS	20°C (68°F)

**SANITIZER FOR HARD, NON-POROUS, FOOD-CONTACT SURFACES.** Effective food contact surface sanitizer at 0.1 to 5.0 ppm. an exposure time of 1 minute. Product may be used on previously cleaned food preparation surfaces; fountain drink and beverage dispensers; glassware, plates and eating utensils; food processing equipment, including beer processing equipment and lines, and food conveyor belts. Make up TwinOxide® using Components A and B per container label instructions to produce a 3,000 ppm stock solution. Use a dilution device or sprayer to achieve a solution between 2.0 to 20 ppm depending on degree of disinfection required. If diluting by hand, use 1 part TwinOxide® to 149 parts water; To create a 2.0 ppm solution, use 1 part TwinOxide® to 1499 parts water

**FOR USE ON HARD, NON-POROUS, NON-FOOD-CONTACT SURFACES.** Effective non-food contact surface sanitizer at 2.0 to 20 ppm depending on degree of disinfection with an exposure time of 5 minutes. Product may be used on non-food contact surfaces, including floors, walls, and furnishings. Make up TwinOxide® per label instructions to produce a 3,000 ppm standard solution. Dilute as necessary to produce a 2.0 to 20 ppm working solution. If diluting by hand, use 1 part TwinOxide® to 149 parts water to produce a 20 ppm solution; To create a 2.0 ppm solution, use 1 part TwinOxide® to 1499 parts water. See Technical Bulletin for alternative dilution instructions and application specifics.

**FOR HARD, NON-POROUS SURFACES:** Product may be used at 20 to 100 ppm with an exposure time of 10 minutes on hard surfaces in residences, hotels, offices, ships, hospitals, schools, factories, nurseries, sick rooms, laundry rooms, eating establishments, medical, veterinary clinics or any other location that may be contaminated Make up TwinOxide® per label instructions to produce a 3,000 ppm standard solution. Dilute as necessary to produce a 20 to 100 ppm working solution. If diluting by hand, use 1 part TwinOxide® to 149 parts water to create a 20 ppm solution; To create a 100 ppm solution, use 1 part TwinOxide® to 29 parts water.

**DOMESTIC APPLICATIONS:** TwinOxide® may be used as a general purpose cleaner on general environmental surfaces, including floors, walls, bathrooms, toilets, kitchen surfaces, sinks, showers. For non-porous surfaces such as ceramic tile, clean surfaces to remove visible dirt and scum. Rinse surfaces thoroughly with a dosage of 200 ppm TwinOxide®. Allow solution to remain in surface contact for 2 minutes. To disinfect toilets, flush toilet. Pour 200 ppm solution of TwinOxide® into bowl. Brush bowl thoroughly. Clean under toilet rim. Let solution stand for 2 minutes. Flush again. Beginning with a 3,000 ppm TwinOxide® standard solution per TwinOxide® label instructions, use a dilution device or sprayer to achieve an appropriate dilution of 200 ppm solution depending on degree of disinfection required. If diluting by hand, use 1 part TwinOxide® to 14 parts water.

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**SPECIAL INSTRUCTIONS FOR CLEANING SURFACES AND OBJECTS PREVIOUSLY SOILED WITH BLOOD/BODY FLUIDS POTENTIALLY CONTAINING HUMAN IMMUNODEFICIENCY VIRUS:** Wear protective barriers such as disposable latex gloves, gowns, masks, and eye coverings when handling items soiled with blood or body fluids. Blood and other body fluids must be thoroughly cleaned from surfaces and objects before application of TwinOxide® solution. Blood, other body fluids, and contaminated cleaning materials should be autoclaved and disposed of according to local regulations for infectious waste disposal.

**SANITIZING AND DEODORIZING GARBAGE CANS, DIAPER PAILS AND WASTE BINS:** Make up TwinOxide® per label instructions to produce a 3,000 ppm standard solution. Dilute as necessary to make up working solution of 200 ppm. If diluting by hand, use 1 part TwinOxide® to 14 parts water. Clean garbage can, diaper pail or waste bin and rinse with water. Drain. Spray in solution TwinOxide®. Allow to stand for 2 minutes. Air dry. Repeat as necessary.

**GENERAL ALGAESTAT AND FUNGISTAT FOR HORTICULTURAL AND GREENHOUSE APPLICATIONS:** For horticultural applications, this product may be used at (100 ppm/10 minutes or 50 ppm/20 minutes) and sanitize (20 ppm/5 minutes) hard, non-porous surfaces; to treat, control, and prevent fungi (5.0 ppm/1hour) attendant slimes, rusts and leaf spot; and to remove slimes (50 ppm/12 hours-overnight) & inhibit reemergence (0.25 ppm/continuous treatment) in irrigation and other non-potable water systems. Beginning with a 3,000 ppm solution: for 100 ppm, use a dilution device or sprayer with a 1:30 dilution (1 part solution to 29 parts water); for 50 ppm, use a 1:60 dilution (1 part solution to 59 parts water); for 20 ppm, use a 1:120 dilution (one part solution to 119 parts water); for 5 ppm, use a 1:300 dilution (one

part solution to 299 parts water); for 0.25 ppm, use a 1:12,000 dilution (one part solution to 11,999 parts water) Concentrations and contact times are application-specific;

**ERADICATION OF NEMATODE WORMS:** Apart from contamination of the water, the Nematode worm is a great danger to agriculture. In order to attack the nematode worm, the following treatment is required. Use TwinOxide® 0.3% solution at 3,000 ppm concentration. Dosage of TwinOxide® 0.3% solution in the Nematode Contaminated Water (NCW): Mix 1 part TwinOxide® 0.3% solution with 3,000 Parts NCW:to produce a dosage rate of 1.0 ppm. Contact Time: Minimum 4 hours. Filtration: The NCW treated with TwinOxide® should be filtered with gravel filtration or sand filtration to remove the Nematode bodies. This is of great importance as, due to this filtration, the micro-organisms will not subsequently be provided with organic nutrition. Thinning Down: Mix 1 part of the filtered water (per 4, above) with 10 parts of water that is NOT contaminated with Nematode. This produces a TwinOxide® 0.3% solution at a concentration of 0.1 ppm..

**POULTRY DRINKING WATER DISINFECTION:** Mix TwinOxide according to label directions to create a 3,000 ppm solution. Use a dosing pump to inject a diluted solution of TwinOxide® into the water system. Stage 1: Depending on the age and maintenance history of the pipe network, this stage requires from 1 to several weeks to fully break down the biofilm layer in the pipe infrastructure. Start with a concentration of 1.0 ppm at the dosing point. Minimal TwinOxide® will be detected at the drinking-end of the system during this phase as the TwinOxide® is consumed to oxidize biofilm. Older systems may require a longer period of exposure to the initial concentration to remove the biofilm build-up. Stage 2: After initial disinfection, the biofilm structure is weakened sufficiently to allow a lower dose of between 0.5 to 1.0 ppm for a period of 2 to 3 weeks, and in cases of high contamination, as long as 8 weeks. . During this period of disinfection, the entire distribution system is completely cleaned of soft biofilm. A very low dose of TwinOxide® is measurable at the drinking nozzles during this time period. Bacteria counts should be performed every 3 to 4 days to measure the bacterial load of the water at drinking points. Stage 3 progresses to the maintenance dosage to keep the drinking water disinfected and prevent the re-colonization of biofilm within the pipe system. This dose is between 0.2ppm to 0.3 ppm (in hot climates). At drinking points, a minimal residual of TwinOxide® (< 0.1 ppm) is acceptable.

**SANITIZING FOAM SOLUTION:** . To eliminate Algae, odors, mold and mildew on surfaces in dark damp areas. Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® down to a level of 100 to 200 ppm depending on the degree of disinfection required to create a working solution. Add 1 part TwinOxide® to 29 parts water to produce a 100 ppm working solution; add 1 part TwinOxide® to 14 parts water to produce a 200 ppm working solution.

**FARM APPLICATIONS:** Continuous on-line water dosing. Make up TwinOxide® stock solution of 3,000 ppm per label instructions using tap water. Use a dosing pump to deliver at a rate of 0.1 to 0.2 ppm **FOR DISINFECTION OF BARN, STABLES, POULTRY HOUSES, HUTCHES, KENNELS:** The following label directions are required for farm premises disinfectants to permit their classification as non-food use products: Do not use in milking stalls, milking parlors, or milk houses (for phenolics, cresylic acid, and pine oils)

Remove all animals and feed from premises, vehicles, and enclosures.

Remove all litter and manure from floors, walls and surfaces of barns, pens, stalls, chutes, and other facilities and fixtures occupied or traversed by animals.

Empty all troughs, racks, and other feeding and watering appliances.

Thoroughly clean all surfaces with soap or detergent and rinse with water.

Saturate all surfaces with 5000 ppm disinfecting solution for a period of 10 minutes.

Immerse all halters, ropes, and other types of equipment used in handling and restraining animals, as well as forks, shovels, and scrapers used for removing litter and manure.

Ventilate buildings, cars, boats, and other closed spaces. Do not house livestock or employ equipment until treatment has been absorbed, set, or dried.

Thoroughly scrub all treated feed racks, mangers, troughs, automatic feeders, fountains, and waterers with soap or detergent, and rinse with potable water before reuse.

**EGG HANDLING:** Hatching Egg Fumigation: Make up TwinOxide® per label instructions using tap water. Fill fogger per fogger manufacturer's instructions. Fog until a complete coverage has been obtained without soaking the eggs. The dosage rate may vary between 0.1 ppm and 0.5 ppm. For sterilizing food eggs, the sanitizer temperature should not exceed 130°F. Spray TwinOxide® at 0.1 ppm so the eggs are completely wet. Dry the eggs completely before packaging or breaking. Do not apply a potable water rinse.

**FOR USE IN INCUBATOR HUMIDIFICATION SYSTEMS:** Make up TwinOxide® per label instructions using tap water to make a stock concentrate at 3,000 ppm. For manual dilution: Dilute to a solution of 1.0 ppm by adding 1 part TwinOxide® to 2,999 parts water. For automated dilution: Fit dosing pump to humidification water supply line and set at 1.0%.

**COOLING TOWERS:** TwinOxide® is effective as an algacide, biocide (biofilm eradication, prevention) and to eliminate the presence of legionnaire's disease from cooling towers. An initial dosage of 0.2 to 0.5 ppm of TwinOxide® will eradicate all common algae. Repeat if necessary until control is maintained. Add TwinOxide® directly to the cooling tower overflow collection pan close to the inlet for the recirculation pump. Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® down to a level of (up to) 0.1 to 0.2 ppm for continuous treatment. For intermittent treatments, dilute TwinOxide® to a working level of 0.5 to 1.0 ppm, treating 3 times per 24 hours.

**COOLING WATER TREATMENT WITH RECIRCULATION:** For effective biofilm and algae control, apply a continuous treatment at 0.1 to 0.2 ppm for critical systems. Initial treatment requires a dosage of 0.5 to 1.0 ppm 3 times per 24 hours, depending on the degree of contamination. Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® down to the required level between 0.5 and 1.0 ppm to create a working solution and 0.1 to 0.2 ppm for continuous treatment.

**MOLLUSK CONTROL:** TwinOxide® is an effective suppressant of problematic mollusks, such as the invasive Zebra Mussel infesting and clogging the intakes of power plants and competing with native species for planktonic foods in lakes and rivers. TwinOxide® kills larval mollusks. Dosages must stay within all local, state and Federal Regulations for discharge. Veliger Control requires continuous treatment at 0.1 to 0.5 ppm. Intermittent dosing residual of 0.2 to 25.0 ppm. Repeat if needed. Continuous dosing residual of 2.0 ppm. Begin by making up TwinOxide® using Components "A" and "B" as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® down to the required level between 0.1 and 0.5 ppm or 2.0 ppm dependent upon application.

**ANTIMICROBIAL APPLICATIONS FOR NON-POTABLE WATER SYSTEMS IN HORTICULTURAL SETTINGS:** This product may be used to reduce microbial populations in non-potable water used with cut flowers to minimize microbial transfer from water to flower, thereby maintaining freshness and extending shelf-life of cut flowers. Beginning with a 3,000 ppm solution, dilute TwinOxide® to achieve a 5.0 ppm solution. See Technical Bulletin for detailed directions and other dilution and application specifics.

**IRON & MANGANESE REMOVAL:** Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® down to the required concentration depending on the measured pH levels and remaining within the limits of all local, state and Federal Regulations for discharge. Precipitate both elements according to the following: Inorganic compounds in a soluble state - 1.0 ppm manganese removed for every 2.45 ppm of ClO<sub>2</sub> above pH 7. 1.0 ppm iron removal for every 1.2 ppm of ClO<sub>2</sub> above pH 5.

**PHENOL DESTRUCTION:** Must stay within all local, state and Federal Regulations for discharge. 1.0 ppm of phenol removed for 1.5 ppm of ClO<sub>2</sub> above pH 10 to Benzoquinone. 1.0 ppm of phenol removed for 3.3 ppm of ClO<sub>2</sub> below pH 10 to Carboxylic Acids. Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® down to the required concentration depending on the measured pH levels and remaining within the limits of all local, state and Federal Regulations for discharge.

**CYANIDE DESTRUCTION:** Must stay within all local, state and Federal Regulations for discharge. 1.0 ppm of Cyanide Ion removed for 2.5 ppm of ClO<sub>2</sub> below pH 10 to Cyanate. Continuous treatment rate at 0.1 to 1.0

ppm. Intermittent treatment rate at 0.1 to 5.0 ppm. System dependant. Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® down to the required concentration depending on the measured pH levels and remaining within the limits of all local, state and Federal Regulations for discharge.

**BACTERIAL SLIME CONTROL IN PAPER MILLS:** Chlorine dioxide is effective for use in controlling microbiological growth in water used in paper mills. Dosages may vary with the degree of microbiological and process contamination present. Depending on the specific requirements of the system, TwinOxide® should be applied continuously or intermittently to achieve a chlorine dioxide residual concentration between 0.1 and 5.0 ppm. Intermittent treatments should be repeated as required to maintain control. Must stay within all local, state and Federal Regulations for discharge. 1.0 ppm of Aliphatic Amines removed for 10.0 ppm of ClO<sub>2</sub> at pH 4.5 to 9.0. 1.0 ppm of secondary aliphatic Amines removed for 5.0 ppm of ClO<sub>2</sub> above a pH of 7.0. Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® down to the required concentration level depending on the measured pH levels and remaining within the limits of all local, state and Federal Regulations for discharge.

**BLEACHING IN THE TEXTILE AND PULP/PAPER INDUSTRIES:** Follow label instructions to prepare a 3,000 ppm solution of TwinOxide®. Dilute to a final concentration between 0.5 and 2.0 ppm depending on the amount of bleaching required. Use with existing sprayers or dip chambers.

**DE-FOULING REVERSE OSMOSIS MEMBRANES:** Using typical oxidizing agents on RO-membranes can cause irreparable damage. However, it is possible to use TwinOxide® upstream of the RO-membrane without damaging the membrane. Depending on the quality of the water, continuous dosage rates between 5 ppb and 100 ppb of TwinOxide® will be sufficient to prevent biofilm fouling of the RO membrane. A dosage rate above 500 ppb may adversely affect the membrane due to the oxidation strength of TwinOxide®. The variation depends on the feed water composition and the amount of organic material present in the feed water. The appropriate dosage rate must be determined by a site-test. Caution: the dosage rate of TwinOxide® should never exceed a level of 500 ppb and should always be a minimum of 5 ppb. While using TwinOxide® there will be no increase in the amount of salts passing through the RO membrane. This is a valid indicator that the membrane is not damaged. An automatic sensor should be used to regulate the TwinOxide® level in the system. Either a chlorine dioxide sensor or potentiostatic analyzer with the ability to measure in the level of parts per billion should be used. To avoid damage to the membrane, the dosing system to inject TwinOxide® into the feed water should be controlled by the monitoring sensor and should automatically stop dosing if levels exceed the maximum levels. Appropriate testing by the customer is recommended. TwinOxide® can be used in the permeates for normal disinfection control and replace existing disinfectants (e.g. chlorine). Standard dosing rates are approximately 0.06ppm

To sterilize an RO system, use an initial dosage rate of 50 to 100ppm. Infuse TwinOxide® in the circulating sterilization solution for 10 to 15 minutes. After that the system should be rinsed several times with tap water. The tap water should be renewed between rinses. After that the system should be rinsed 3 to 4 times with de-ionized water. Once drained, the system is ready for use and the membrane can be installed. **Care should be used when using TwinOxide® on cellulose-based membranes. Be sure to always use a very dilute solution. Never use the 3,000 ppm stock TwinOxide® solution.**

**FOR CLEAN-IN-PLACE APPLICATIONS FOR POTABLE WATER SYSTEMS:** Product may be used to clean lines used in fountain drink or other beverage preparation, storage, transfer and dispensing. Beginning with a 3,000 ppm solution of TwinOxide®: use a dilution device with a 1:60 dilution (one part 3,000 ppm solution to 59 parts water) to achieve a 50 ppm solution (10-minute exposure time); or, use a dilution device or sprayer with a 1:60 dilution (one part 5000 ppm solution to 59 parts water) to achieve a 50 ppm solution (10-minute exposure time). See Technical Bulletin for preparation directions and other dilution and application specifics.

**POTABLE WATER DISINFECTION:** A dosage rate of TwinOxide® at 0.2 ppm to as low as 0.5 ppb (parts per billion) has proven sufficient to disinfect water, remove biofilm and prevent re-colonization. Residual disinfectant and disinfection byproducts must be monitored as required by the National Primary Drinking Water Regulations (40 CFR Part 141) and state drinking water standards. . Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to a 0.2 to as low as 0.5 ppb solution depending on the degree of antimicrobial fouling. See Technical Bulletin for detailed directions and other dilution and application specifics.

**WASTEWATER TREATMENT:** TwinOxide® is effective as an oxidant and disinfectant in wastewater treatment. Dosages will vary with water conditions and the amount of organic matter in the water. For most municipal and other wastewater systems, a residual concentration of up to 5.0 ppm is sufficient to provide

disinfection. 5.0 ppm of TwinOxide® will remove 1.0 ppm of sulfide (sulfide ion) for sulfide odor eradication between pH 5-9.

**WELL WATER TREATMENT:** The well casing should be flushed with TwinOxide® to wash off organic matter, and algae. The well should be backwashed to increase yield and reduce turbidity. TwinOxide® solution of 10 ppm should be used as the backwash. After treating the casing and completing the backwash add sufficient TwinOxide® solution to maintain a residual of 1.0 to 2.0 ppm. A chlorine dioxide test kit should be used to monitor the residual level. Re-treat well if water samples are biologically unacceptable. Begin by making up TwinOxide® using Components "A" and "B" as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® down to the required level between 10 ppm and 1.0 to 2.0 ppm to create a working solution.

**DISINFECTION OF SWIMMING AND WADING POOLS:** Stop the dosing of chlorine for at least 1 day and maximum 3 days; Disinfect filters by soaking in water with 10 ppm TwinOxide® for 6 to 8 hours. Begin by making up TwinOxide® using Components "A" and "B" as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® to a level of 40 to 50 ppm (to create a working solution and back flush the filter(s)). Add a primary dosage of at least 0.6 ppm and maximum 1.0 ppm TwinOxide® to the swimming pool (based on the total volume of water in the swimming pool system) in the evening so that overnight dosing is optimized without the presence of swimmers in the swimming pool; After the initial dosage of TwinOxide® keep the level of TwinOxide® in the pool at a continuous level of at least 0.2ppm; A monthly standing disinfection of the filters is recommended. TwinOxide® is an ideal disinfectant for swimming pools as it is a liquid and has no insoluble component. 100% of the concentrate infused into the target water is used as an oxidizer. The product is non corrosive, causes no smell or irritation to skin, eyes, nasal passages, ears, mucous tissue and swimming apparel. TwinOxide® has no effect on materials used in pool construction including swimming pool liners, pumps, filters, valves, pipes and seals.

The rate of dosage should be adjusted so the required quantity of TwinOxide® is uniformly delivered and circulated at a level of 0.6 ppm and maximum 1.0 ppm. TwinOxide® should be added continuously. Concentration levels should be measured with an automatic sensor, linked to an automatic dosage pump to ensure consistency. If local regulations disallow automatic sensing equipment the concentration level should be measured at least once per day, advisably in the evening so that overnight dosing is optimized without the presence of swimmers in the swimming pool.

**RE-ENTRY:** Bathers should not be allowed to re-enter pools until the chlorine level drops to 0.6 to 1.0 ppm.

**DISINFECTION OF HOT TUBS/SPAS:** For hot tubs and spa's a half gallon package can be used each month in order to keep the tub sanitized. No other disinfectants or stabilizers are required to keep the tub clean, although TwinOxide™ does not remove scale. A black plastic ½ gallon bottle is used to make the 3,000 ppm TwinOxide™ solution. Dilute 1 pint of the 3,000 ppm TwinOxide™ solution into 1 gallon of tub water to create a diluted solution every 3-4 days. Pour this diluted solution into the tub gradually. Leave the tub for an hour before use.

**RE-ENTRY:** Bathers should not be allowed to re-enter hot tubs/spas until the chlorine level drops to 0.6 to 1.0 ppm.

**Filter Cleaning**

Filters should be cleaned once a month by putting them in a 15 gallon drum with water and 1/8 gallon of TwinOxide™ for 6 hours. Rinse with tap water once a month.

**SANITIZING DAIRY EQUIPMENT:** TwinOxide® is effective as a sanitizer and deodorizer of dairy industry equipment. A dosage of 50 to 100 ppm and an exposure time of 2 minutes are required. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to a 50 to 100 ppm depending on the degree of microbial fouling. See Technical Bulletin for detailed directions and other dilution and application specifics. Use an automatic sensor or test kit to maintain solution at the desired strength. Normal operating temperatures are +/- 75F. If operating at lower temperatures the concentration of TwinOxide® may be increased to the higher end of the above scale. Milk deposits and other organic matter should be removed by mechanical means prior to the application of TwinOxide®. Do not mix Twinoxide® with acid cleaners. Rinse equipment thoroughly with potable water.

**SANITIZING STORAGE TANKS AND PIPELINES:** After emptying the tank or pipeline, flush with potable warm water. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 50 ppm in the flush water and circulate the flush water through the system for 5 to 10 minutes. Use hot

water if available, up to 160°F throughout the entire circulation system. Flush with potable water. Drain. Air dry. Close tanks to protect against contamination. Do not mix TwinOxide® with acid cleaners.

**SEPARATORS, STRAINERS, CHURNS, PASTEURIZERS CANS, and PAILS:** After use rinse with clean water. Wash or spray with a solution of 50 ppm Twinoxide. Rinse with clean water. Drain and air dry. Do not mix TwinOxide® with acid cleaners. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 50 ppm in the wash or spray water by adding 1 part TwinOxide® to 59 parts water.

**TRANSPORTATION, LOADING AND HAULING EQUIPMENT:** Ship containers, railroad cars, railroad tank cars, trucks, truck trailers, loading chutes, re-useable crates and other equipment for transportation of animals, meat, produce, vegetables, should be cleaned and disinfected prior to use. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 20 to 50 ppm depending on the degree of contamination. Do not mix TwinOxide® with acid cleaners. Wash, scrub/spray all exposed areas. Pressure-spray or scrub with solution. Expose all surfaces to spray for a minimum of 2 minutes. Rinse with clean water. Dry before use.

**CAR, TRAIN AND TRUCK WASH WATER:** TwinOxide® is effective at commercial car wash operations and at facilities engaged in washing trucks, trains, boats and RV's. Waste water is commonly used as the wash water. Waste water brings problems including pit odor, ~~increased overheads~~ and increased overheads in disposal costs. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 5 ppm depending on the degree of contamination. TwinOxide® will eliminate both aerobic and anaerobic bacteria.

**OIL & GAS INDUSTRY APPLICATIONS:** TwinOxide® is effective in the elimination of bacterial and sulfide contamination commonly found in down hole wells, oil field production, injection and disposal fluids, separators and pipelines. Eliminates odors caused by bacteria such "iron eating" bacteria and bacteria that cause odor problems associated with hydrogen sulfide gas. The required dosage levels will vary according to site-specific conditions. TwinOxide® may be applied intermittently or continuously to oil well production water at the point where it is separated from oil, and prior to re-injection back into the well. For continuous feeds, for oxidation of sulfides to sulfates and for biological control TwinOxide® should be applied at a dosage level slightly higher than the oxidative demand as determined by a demand study. For intermittent treatment, a dosage rate of 200 to 3,000 ppm. Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Dilute TwinOxide® down to the required level between 3,000 ppm and 200 ppm to create a working solution.

**DISHES, GLASSWARE, SINKS, and UTENSILS:** Wash in warm water with 20 ppm TwinOxide®. Solution for a minimum of 2 minutes. Drain dry. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 20 ppm. As the product is not corrosive at this dosage level it may be used to clean steel, aluminum, silver, and other metal utensils, pans, basins and pots. Do not use TwinOxide® in boiling water or steam cleaners/dishwashers. Run-off of TwinOxide® will deodorize drains and prevent biofilm build-up in grease traps.

**ORNAMENTAL WATER APPLICATIONS SUCH AS FISH PONDS, FISH FARMS, CULTIVATED SHELLFISH, SHRIMP AND AQUARIA:** TwinOxide® has proven effective as an algaestat and against all common water-borne organisms that are suppressant against fish, both ornamental and food sources. These include Viral Hemorrhagic Septicemia (VHS). Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 0.2 ppm in the target water.

**AGRICULTURAL IRRIGATION AND FUNGICIDE:** TwinOxide® acts as a soil sanitizer and irrigation system biofilm remover in agricultural, horticultural and viticulture applications. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 0.1 to 0.2 ppm in the irrigation water. TwinOxide® is also effective as a fungicide when used in spray or fog form to eliminate mold from plants, leaves, fruits and grapes.

**MILK, WINE, WATER AND WINE BOTTLES:** Clean and rinse with 20 ppm solution of TwinOxide® prepared with cold or warm water. Drain thoroughly and air dry. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 20 ppm by adding 1 part TwinOxide® to 149 parts water. Do not mix TwinOxide® with acid cleaners.

**ENOCCULTURE AND VITICULTURE:** In addition to washing wine bottles as stipulated in the section **SANITIZING MILK, WINE, WATER AND WINE BOTTLES,** above, TwinOxide® disinfects, sanitizes and cleans without producing trichloroanisoles (TCA's) or precursor trichlorophenols (TCP's), which affect wine

quality by creating odors. Twinoxide® is an effective disinfectant without compromising the quality of the wine. Unlike other sanitizing products that chlorinate and create TCA and TCP residuals, TwinOxide® reduces yeast and mold without affecting the quality of wine. TwinOxide® and protocols are optimized to inhibit and control spoilage organisms on grapes for further processing, picking bins, crushers, hoses, destemmers, sealed concrete floors, walls, and steel or wooden wine barrels. The dosage rate varies with each application and local criteria. Determination of the optimum dosage level requires site-specific trial. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to the required dosage level in the target water for the specific application as per manufacturer's instructions.

**HYDROGEN SULPHIDE SCAVENGING:** TwinOxide® is an effective scavenger of hydrogen sulfide, whether the hydrogen sulfide is in a gaseous state or dissolved in water. TwinOxide® is also powerful scavenger of inorganic or organic sulfides. TwinOxide® can be used in low temperature applications and in high temperatures max. 72 degrees C. It is non corrosive to equipment and does not form chlorinated hydrocarbons. The dosage rate varies with each location and local criteria. Determination of the optimum dosage level requires site-specific trial. The average dosage rate is approximately 2.0 ppm. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 2.0 ppm in the target water to remove the smell problems.

**NOX REDUCTION AND EMISSION SCRUBBING:** NOX is a precursor to ozone in the atmosphere, and is believed to be a major contributor to acidic deposition (acid rain). NOX is produced in a variety of different processes, including combustion equipment, gas turbines, incinerators, kilns and power plants. TwinOxide® can be used in a wet removal (stack scrubber) process.

The use of stoichiometric amounts of chlorine dioxide eliminates approximately 95 percent of the NO in the gas in concentrations of up to at least 24 ppm in less than 2 seconds. TwinOxide® solution eliminates traditional problems associated with chlorine dioxide production. Use in a scrubber spray at 24 ppm. TwinOxide® is non corrosive to equipment. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to the required dosage level in the scrubber system water for the specific application as per manufacturer's instructions.

**PULP & PAPER & TEXTILES:** TwinOxide® has excellent bleaching capacities and applications both in the paper/pulp and textile industries. TwinOxide® allows environmental discharge to be reduced to a minimum. It eliminates harmful disinfection by-products (HAA's, AOX, THM's and MX). In the textile industry chlorinated materials at high levels must be prevented from bonding in the textile fibers. TwinOxide® solves this problem by eliminating the disinfectant by-products. Dosage rates depend on the level of bleaching required. In general a dosage rate of 0.05 - 2.0 ppm is adequate for all purposes within the industries. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to the required dosage level for the specific application as per manufacturer's instructions.

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