

# **Agricultural TwinOxide® applications**

Below we send you an overview of various TwinOxide® applications in practice . All dosage rates mentioned are benchmarked into a practical situation but we advise you to consider the dosage rates to be an indication that must be verified per situation.

We are confident that this information contributes to your mark expansion with TwinOxide®!

- *LIVESTOCK APPLICATIONS*
  - *DAIRY*
  - *HOGS*
  - *POULTRY*
  - *FISH*
  - *MEAT PROCESSION*
- *CROPS & IRRIGATION*
- *HORTICULTURE*
- *WINE PRODUCTION*
- *GENERAL DISINFECTION*

**LIVESTOCK APPLICATIONS ; DAIRY**

**DRINKING WATER FOR DAIRY CATTLE:**

Dose drinking water with 1.0 ppm TwinOxide® to reduce the bacteria counts in milk. Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 1.0 ppm and infuse to regular drinking water supply using an automatic dosing meter and chlorine dioxide sensor or test kit to ensure consistency of feed.

**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.

**SANITIZING MILKING MACHINES AND UTENSILS:**

After milking, flush equipment with potable water. Dismantle equipment post-milking. Wash equipment, including all rubber parts and tubes and all utensils with a solution of standard detergent and a solution of 100 ppm TwinOxide®, ensuring an exposure time of 1 minute. Water should be warm, 100+°F. Do not mix TwinOxide® with acid cleaners. Rinse equipment and utensils thoroughly with potable water.

**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 RUBBER or METAL TEAT CUPS AND EQUIPMENT:**

Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to achieve a 50 - 100ppm working solution. Soak equipment tubes and rubber suction cups with 50 to 100 ppm solution for 2 minutes to sterilize before milking and prior to switching from one cow to another. After each milking, soak or wash rubber cups and tubes. Rinse tubes and cups with potable water. Metal cups should be washed, not soaked. 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.

**SANITIZING 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.

**SANITIZING MILK and WATER 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.

**DISINFECTION OF BARNs, STABLES:**

Mechanically clean all litter, bedding, straw, sawdust etc, 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 including floor, walls, ceiling posts and support beams. Expose all surfaces to spray for a minimum of 2 minutes. Rinse with clean water. Dry before housing animals.

**SANITIZING 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.

## **LIVESTOCK APPLICATIONS ; HOGS**

### **HOGS 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 0.1 ppm to 0.2 ppm (in cold climates). At drinking points, a minimal residual of TwinOxide® (< 0.1 ppm) is acceptable.

### **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.

### **DISINFECTION OF HOGBARNES & STABLES :**

Mechanically clean all litter, bedding, straw, sawdust etc, 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 including floor, walls, ceiling posts and support beams. Expose all surfaces to spray for a minimum of 2 minutes. Rinse with clean water. Dry before housing animals.

### **SANITIZING 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.

## **LIVESTOCK APPLICATIONS ; POULTRY**

### **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 0.1 ppm to 0.2 ppm (in cold climates). At drinking points, a minimal residual of TwinOxide® (< 0.1 ppm) is acceptable.

### **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.

### **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.

### **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%.



**DISINFECTATION OF BARNs & POULTRY HOUSES:**

Mechanically clean all litter, bedding, straw, sawdust etc, 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 including floor, walls, ceiling posts and support beams. Expose all surfaces to spray for a minimum of 2 minutes. Rinse with clean water. Dry before housing animals.

**SANITIZING 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.

**LIVESTOCK APPLICATIONS ; FISH**

**CLEANING SHRIMPS:**

Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Washing water contains a dosage of 5.0 to 10 ppm TwinOxide® solution, made by adding 1 part TwinOxide® to 599 parts water (to produce 5 ppm) and 299 parts water (to produce 10 ppm). During sizing and peeling, washing with 2.0 to 3.0 ppm TwinOxide® solution. Produce these working solutions by adding 1 part TwinOxide® to 1,499 parts water (for 2 ppm) and 999 parts water (for 3 ppm). Final rinse using 0.2 to 0.5 ppm TwinOxide® solution, made by adding 1 part TwinOxide® to 14,999 parts water. Freeze afterwards.

**WASHING FISH:**

Use in ice to extend shelf life: 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 to be dosed into water to be frozen or used as wash water. Make these working solutions by adding 1 part TwinOxide® to 74 parts water (for a 40 ppm solution) or 59 parts water (for a 50 ppm solution).

**ORNAMENTAL WATER APPLICATIONS SUCH AS FISH PONDS, FISH FARMS, CULTIVATED SHELLFISH, SHRIMP & AQUARIA:**

TwinOxide® has proven effective as an algacide and against all common water-borne bacteria and as a suppressant against viruses deadly to fish, both ornamental and food sources. These include Viral Hemorrhagic Septicemia (VHS) and Koi Herpes Virus (KHV). Make up TwinOxide® per label instructions to create a 3,000 ppm solution. Dilute to 0.2 ppm in the target water.

**LIVESTOCK APPLICATIONS ; MEAT PROCESSION**

**CHICKEN CARCASS WASHING:**

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) 3.0 ppm to create a working solution by adding 1 part TwinOxide® to 999 parts water. Follow with a potable rinse.

**SWINE CARCASS CLEANING:**

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 500 to 1,200 ppm depending on the degree of disinfection required to create a working solution. Follow with a potable rinse.

**PROCESSING RED MEAT, RED MEAT PARTS AND ORGANS, BEEF CARCASS CLEANING:**

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 500 to 1,200 ppm to create a working solution. Follow with a potable rinse.

**SANITIZING 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.

For further applications see chapter: " GENERAL DISINFECTION WITH TWINOXIDE"

**CROPS:**

**FRUIT AND VEGETABLE WASH TO EXTEND FRESHNESS AND SHELF-LIFE:**

TwinOxide® may be used at 5.0 ppm for 1 minute to reduce spoilage due to micro-organisms on raw agricultural commodities in food processing facilities. Mix TwinOxide® according to label directions to create a 3,000 ppm solution. Use a dilution device or sprayer with a 1:600 dilution (add one part 3,000 ppm solution to 599 parts water) to achieve a 5.0 ppm solution. Spray or dip RACs, and follow with a potable water rinse or by canning, blanching, or cooking. See Product Technical Insert for detailed directions and other dilution and application specifics.

**CLEANING POTATOES:**

Potatoes are transported by truck and placed into heaps. They are then washed and cut into various shapes prior to freezing. Water used for processing is from municipal supply. Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. TwinOxide® solution is dosed into the water at 0.7 to 1.0 ppm to maintain concentration of 0.5 ppm of ClO<sub>2</sub> residual. If diluting by hand, add 1 part TwinOxide® to 2,999 parts water to produce a 1.0 ppm solution. To produce a 0.7 ppm solution, add 1 part TwinOxide® to 4,499 parts water. Potatoes are cut and washed using TwinOxide® treated water.

**FUNGICIDE FOR SEED POTATOES:**

TwinOxide® is an effective fungicide against Verticillium wilt organism V and microsclerotial albo-atrum on seed potatoes. A solution of TwinOxide® may be applied to whole seed potatoes and cut seed potatoes during the cutting operation prior to planting to prevent the spread of organisms to uninfected soil via seed potatoes. Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Add 1 part TwinOxide® to 599 parts water to produce a 50 ppm working solution. Spray clean seed potatoes with a solution of 50 ppm TwinOxide® on the cutting chain or elevator. Do not mix TwinOxide® with acids or other agricultural chemicals. Use non-misting nozzles to avoid breathing of spray or wear standard safety respirator equipment.

**CLEANING LETTUCE:**

Lettuce is cleaned in a 2-stage wash. Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Create a TwinOxide® solution of 1.0 ppm by adding 1 part TwinOxide® to 2,999 parts water. The first wash is at 8 deg. C and the 2nd wash is at 2 deg C. Final rinse using clean, potable water.

**CLEANING CORN, PEAS & BEANS:**

General process water contains 0.5 ppm chlorine (municipal supply). Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Wash water is made up of process water with up to 2.0 ppm TwinOxide® added. To produce a 2.0 ppm working solution, mix 1 part TwinOxide® with 1,499 parts water. Corn is blanched and then allowed to cool. Micro-biological growth can occur during cooling stage. The corn is cooled by water spray with up to 2.0 ppm TwinOxide® solution.

**CLEANING CARROTS:**

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 up to 5.0 ppm to create a working solution by adding 1 part TwinOxide® to 599 parts water. Follow with a potable rinse.

**CLEANING UNCUT/UNPEELED FRUITS AND VEGETABLES:**

Begin by making up TwinOxide® using Components A and B as per label instructions to produce a 3,000 ppm stock solution. Water, containing up to 3.0 ppm residual chlorine dioxide may be used for washing fruits and vegetables that are not raw agricultural commodities in accordance with 21CFR§173.300. Dilute TwinOxide® to a level of up to 3.0 ppm to create a working solution by adding 1 part TwinOxide® to 999 parts water. Follow with a potable rinse. Citrus fruit is immersed in wash tank filled with re-circulated water that is dosed with TwinOxide® at a rate of 1.0 to 2.0 ppm to ensure a residual of 0.035 ppm TwinOxide® solution. Follow by a potable rinse.

**CLEANING SHELLED BEANS & PEAS (unblanched with intact cuticles):**

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) 5.0 ppm to create a working solution by adding 1 part TwinOxide® to 599 parts water. Follow with a potable rinse.

**CLEANING CORN (Husked on Uncut Cob):**

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) 5.0 ppm to create a working solution by adding 1 part TwinOxide® to 599 parts water. Follow with a potable rinse.

**CLEANING CUT AND PEELED FRUITS & VEGETABLES:**

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) 3.0 ppm to create a working solution by adding 1 part TwinOxide® to 999 parts water. Follow with a potable rinse.



**RAW AGRICULTURAL COMMODITIES:**

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 500 to 1,200 ppm depending on the degree of disinfection required to create a working solution. Follow with a potable rinse. To make a 500 ppm solution, take 1 part TwinOxide® and add it to 5 parts water. To make a 1,200 ppm solution, add 1 part TwinOxide® to 899 parts water.

**REMOVAL OF MOULD FROM TOMATOES AND FLUME TANK:**

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 to be dosed into the flume tank to maintain a concentration of 0.2 to 0.4 ppm to destroy molds on the tomatoes and the flume tank. Add 1 part TwinOxide® to 14,999 parts water to produce a 0.2 ppm solution; add 1 part TwinOxide® to 7,499 parts water to produce a 0.4 ppm working solution. Follow with a potable rinse.

**IRRIGATION ;**

**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 mould from plants, leaves, fruits and grapes.

**WELL WATER TREATMENT:**

The well casing should be flushed with TwinOxide® to wash off organic matter, fungus, algae and aerobic bacteria. 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

## **HORTICULTURE ;**

### **GENERAL DISINFECTANT, SANITIZER, ALGAEICIDE AND FUNGICIDE FOR HORTICULTURAL AND GREENHOUSE APPLICATIONS:**

For horticultural applications, this product may be used to disinfect (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) (*Penicillium digitatum*, *Botrytis Sp*, *Fusarium solani* & *oxysporum f. sp. Basillicum (Fob)*, and *Pythium irregulare* & *aphanidermatum*), algae (*Phormidium boneri*), and 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; see Technical Bulletin for detailed directions and other dilution and application specifics.

### **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.

**WELL WATER TREATMENT:**

The well casing should be flushed with TwinOxide® to wash off organic matter, fungus, algae and aerobic bacteria. 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.

**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..

## **WINE PRODUCTION ;**

### **ENOCULTURE 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.

### **SANITIZING WATER & 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.

**GENERAL DISINFECTION WITH TWINOXIDE ;**

**SANITIZER FOR HARD, NON-POROUS, FOOD-CONTACT SURFACES.**

Effective food contact surface sanitizer at 0.1 to 5.0 ppm depending on the degree of disinfection required, against E. coli and E. coli O157:H7, Salmonella typhimurium (MDRS), and Staphylococcus aureus with 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. See Technical Bulletin for alternative dilution instructions and application specifics.

**SANITIZER FOR HARD, NON-POROUS, NON-FOOD-CONTACT SURFACES.**

Effective non-food contact surface sanitizer at 2.0 to 20 ppm depending on degree of disinfection required against Staphylococcus aureus and Klebsiella pneumonia 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.

**DISINFECTANT OR VIRUCIDE FOR HARD, NON-POROUS SURFACES:**

Product may be used at 20 to 100 ppm with an exposure time of 10 minutes to disinfect 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 with Staphylococcus aureus, Salmonella choleraesuis, Pseudomonas aeruginosa, methicillin-resistant S. aureus, vancomycin-resistant Enterococcus faecalis, Mycobacterium bovis (TB) and Trichophyton mentagrophytes (athlete's foot), Corona virus, Feline Calicivirus, Hepatitis A, Human Immunodeficiency Virus Type 1 (HIV-1), Poliovirus-1, and Rotavirus. 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.

**SANITIZING FOAM SOLUTION:**

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.

**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.

**SANITIZING 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.

**DISINFECTION OF BARNs, STABLES, POULTRY HOUSES, HUTCHES, KENNELS:**

Mechanically clean all litter, bedding, straw, sawdust etc, 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 including floor, walls, ceiling posts and support beams. Expose all surfaces to spray for a minimum of 2 minutes. Rinse with clean water. Dry before housing animals.

**SANITIZING 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.



**SANITIZING 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.

**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.

**WELL WATER TREATMENT:**

The well casing should be flushed with TwinOxide® to wash off organic matter, fungus, algae and aerobic bacteria. 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.