

POULTRY FARM WATER MANAGEMENT

Bio-security Systems from TwinOxide International B.V.

TwinOxide® 0.3%

The complete sanitizer and deodorizer – TwinOxide® prevents bacterial infection on the farm and in the processing plant.

TwinOxide® 0.3%

Total farm disinfectant. Can be used to improve egg hatchability, and as general farm disinfectant. Chlorine, Chlorite, Chlorate, Gluteraldehyde and formaldehyde free.

SAFE & EFFECTIVE WATER TREATMENT FOR POULTRY - HELPS BREAK THE DISEASE CYCLE THAT THREATENS YOUR STOCK.

- What is TwinOxide®?

TwinOxide® is a powerful, non-toxic oxidizing biocide, which is Bactericidal, Virucidal, Sporicidal and Fungicidal. TwinOxide® destroys Amoebae and suppresses Oocysts such as Cryptosporidium and Giardia. As it destroys Proteins and Cell Structures no resistant strains can develop. TwinOxide® destroys and removes Biofilm – provides a clean water distribution system in which pathogens cannot lodge and multiply.

TwinOxide® is compliant to the Drinking Water Inspectorate and the EPA for use in potable water. TwinOxide® is compliant to the FDA regulations for washing of Chicken and Meat. Compliant to the regulations as a Terminal Food Surface Sanitizer – TwinOxide® can be used on Food Surfaces without a potable water rinse.

TwinOxide® can extensively be used in Hospitals, Hotels and Public Buildings. Extensive test data is available from Field Testing in a wide range of locations. The Biofilm Destruction Capability is proven as TwinOxide®'s foundation is based on Chlorine Dioxide.

Dose rates may vary depending on water quality and whether dosing is targeted to sanitize the water only or also to provide a residual to combat environmental contamination in the livestock house. The cost of TwinOxide® is competitive, and is less than terminal sanitizers, which are not approved potable water disinfectants.

For a small investment a poultry producer can play a part in reducing Salmonella, Campylobacter, E coli and other contamination of farm produce – providing better quality food for the consumer and greatly improving the image of the Industry.

Dilute TwinOxide® powder Component A and powder Component B into a designated amount of clean water. Wait according to the time table. After 1-3 hours TwinOxide® 0,3% (3g/l ClO₂) solution is ready for dosing into your water using a conventional proportional-dosing unit. Depending on need the dose rate normally will vary between 0.2% or 0.6%. The solution concentration can be varied to suit the dose rate required.

When handled with care TwinOxide® 0,3% is safe to use and cannot explode. Mixing should be carried out in a ventilated area. Never add Component A and B together before diluting in the water. The TwinOxide® components are delivered in single-use secure UN pails. Avoid spillage and ensure that the MSDS are carefully read and understood before using TwinOxide®.

For large farms, particularly those with bore-holes or spring water supplies it may be advisable to consider installing a central dosing plant to treat all the farm water. Such a plant must be designed to suit the specific requirement of each site providing simple manual mixing with proportional flow dosing units with possible monitoring and control systems.

- Why do you need to disinfect your water supplies?

Mains, bore-hole or spring water is seldom totally free from contamination. Mains water often is contaminated in old (rusty) pipes or by deposits drawn into the service pipes through pipe failures. Bore-hole and spring water will carry pathogens recycling from farm or industrial land in the catchments area. Once delivered to your farm contamination levels will be increased by the build up of organisms in the biofilm and slime that exists in the farm's tanks and pipe-lines. Bacteria and virus will be transported from the drinking points back into the pipes where they will colonize in the biofilm. Periodically some of these colonies will find their way into the water stream and result in constantly recycling infection causing higher mortality and lower production levels.

- How should I protect my water services?

The minimum requirement is to clean the tanks at the end of every crop and then to disinfect both the tanks and pipe-lines. However this procedure has only a very short term effect particularly as biofilm growth will re-occur within hours of the disinfection. The longer the biofilm is established the more difficult it is to remove it. It is preferable to use constant low level dosing to maintain high levels of disinfection. It makes sense to protect your stock at all times.

- Why is TwinOxide® the best product to use?

TwinOxide® 0,3% is a solution of chlorine dioxide, and chlorine dioxide is established as the most effective, public drinking water approved, oxidizing disinfectant. Only oxidizing chemicals can remove biofilm and only oxidizing chemicals can so completely destroy pathogens that resistant strains cannot develop. Unlike chlorine, which has very little oxidizing power, chlorine dioxide is not affected by the pH of the water and it will be effective in hard water conditions. Ultra Violet and ozone are very effective disinfectants but neither can maintain a residual in the water and so do not prevent the growth of biofilm nor protect against contamination either in the pipe line or at the drinking point. Further power driven disinfectants are not environmental friendly.

- How much TwinOxide® should I use?

There are two levels of protection. The first is to provide disinfection to ensure that the incoming water is sanitized and that there is sufficient residual to prevent the formation of biofilms. To achieve this, the standard recommendation for dosing is 2ppm TwinOxide®. The second level of protection requires a residual to be present in the water at the drinking point. The water at the nipple or in the drinker is exposed to bacterial contamination from the environment, oxygen and high ambient temperature. This causes a rapid explosion of the bacterial population in the water and greatly increased cross infection. The only way to avoid this is to ensure a residual of around 2ppm in the water and this is normally achieved by increasing the overall treatment level to 3ppm TwinOxide®.

- What disadvantages or problems may result from the use of TwinOxide®?

TwinOxide® and its activators are chemicals and require to be treated according to the instructions given. If this is done there are no handling problems. Dosing is very simple and uses equipment which is standard to the Industry. It is not possible to say with certainty TwinOxide® will not react with products used to vaccinate or medicate so as a standard we recommend that TwinOxide® is not used during water treated vaccinations or medications. If these are likely to be carried out then TwinOxide® should not be dosed into storage tanks or water lines during treatment.

HATCHERY MANAGEMENT

- Reduce infection by improving water quality

The use of untreated water in egg setting and hatching machines may lead to the introduction of pathogens coming from the water supplies. The temperature and humidity of these machines will ensure a massive increase in numbers. The only way to prevent this happening is to disinfect the water with solutions of TwinOxide® prior to use. The addition of TwinOxide® into the humidity control water can also be effective in controlling contamination introduced either in the air or on the eggs.

- Safer fumigation of eggs, chicks and machines

Formaldehyde is a dangerous chemical to use and is under severe restraint on health and safety grounds. It is also known to affect the chicks when used in hatching machines and reduces the effectiveness of vaccinations. Formaldehyde can be replaced with TwinOxide® and hatch results will be improved.

- Regular Misting and Fogging to reduce microbial counts

The most effective way to control the build up of spores and fungi in hatcheries and on farms is regular fogging of TwinOxide®. There are a number of commercial systems readily available. Fully automated systems with timer controls will provide the best protection for the larger buildings. If TwinOxide® is not used to disinfect humidification water, fog it regularly into setting machines. In addition to controlling microbial counts TwinOxide® will also destroy noxious odors and small trigger

sprays and wipes should be kept at hand in case of "accidents".

- What is TwinOxide® 0.3%?

TwinOxide® 0.3% has only recently been introduced to the market and is very well applicable into the Poultry Industry. As TwinOxide® 0.3% is a chlorine dioxide (but with powerful additional characteristics and features), it is known as a powerful disinfectant and oxidizing agent for many years. It is an unique formulation of chlorine dioxide, therefore covered by numerous patents and – very important – TwinOxide® is fully compliant with European Regulation EN 12671 (describing the quality of drinking water in the EC countries) and the most stringent law on drinking water (the German TVO). TwinOxide® 0,3% is delivered as a two-component powder based kit that needs to be diluted into a certain amount of water prior to use. When ready it can be dosed with standard available dosing equipment.

- This is how TwinOxide® works

TwinOxide® attacks and completely destroys the pathogens – even the pathogens that are resistant to quaternary resistant organisms. The presence of chlorine dioxide not only destroys the free moving pathogens but it also ensures an attack on the biofilms attached to the surfaces. These biofilms are unaffected by most of the ordinary disinfectants. The activity of TwinOxide® is protracted and as a result there is a good residual protection. The majority of biocidal problem causers are completely destroyed in seconds.

- How effective is TwinOxide®?

TwinOxide® is a total concept providing the most effective disinfectant power available on the market. It is Bactericidal, Virucidal, Fungicidal and most importantly Sporocidal. Fungi and Spores are extremely dangerous in a farm and hatchery environment. Many spores are now resistant to disinfectants and spores are now known to exist in disinfectants including those based on alcohol. When used at recommended treatment levels TwinOxide® has been shown to be effective against a very wide range of organisms commonly seen in farm, hatchery and food plants - including Salmonella, E. coli. TwinOxide® is used in a large number of critical disinfection areas such as drinking water plants, sewage plants, laboratory clean rooms, process water and oil wells.

In recent tests carried out for the Health Care Industry chlorine dioxide has been shown to be effective against the

methicillin (antibiotic) resistant Staphylococcus aureus epidemic strains (EMRSA 15 & 16). As TwinOxide® is based on chlorine dioxide it can be used in hotels and cruise ships to control serious outbreaks of Viral Gastro enteritis when it is associated with Norwalk virus infections.

- How safe is TwinOxide®?

TwinOxide® does not contain Gluteraldehyde or Formaldehyde both of which are common disinfectants used in the Poultry Industry even though they carry significant hazard labels. We however recommend that as with all chemicals the product is used according to instructions and in particular direct contact with the eyes or sensitive skin is avoided.

- Where and how is TwinOxide® applied?

TwinOxide® can be applied in numerous applications fields. The most common application is through mobile or time controlled fixed fogging units or for aerial applications in hatcheries, egg stores and within breeding and growing houses. TwinOxide® can be used as an egg disinfectant by applying with a spray or a dip.

GUIDELINES FOR TWINOXIDE® USE ON FARMS AND IN HATCHERIES

All recommendations are subject to approval by local regulation. Detailed recommendations are set out in the health and safety sheets and these must be observed.

FARM APPLICATIONS

- Continuous on line water dosing

Standard TwinOxide® 0,3% dosage rate 0.1ppm – 0.2ppm. Use a proportional pump.

- Aerial fogging of buildings

After filling a fogger canister set fogger to high and fog each area for approx. five minutes. You can consider to fog twice per week and daily at times of challenge. The dosage rate may vary between 0.1ppm – 0.5 ppm.

- Egg Handling

Fumigation - Hatching egg fumigation. Use tapwater to make TwinOxide® and fill fogger and fog eggs until a good coverage is achieved without soaking the eggs. The dosage rate may vary between 0.1ppm – 0.5 ppm.

HATCHERY APPLICATIONS

Hatching Egg Storage Room Fog with TwinOxide®. Set fogger to high and fog each area for five minutes.

- General Areas within Hatchery

Set fogger to high and fog each area for five minutes.

- Incubator humidification systems

Fit proportional flow dosing pump to humidification water supply line and set at 1%. Where water reserve tanks are used in the incubator add TwinOxide® daily to the tanks.

- Hatching machine fumigation

Use TwinOxide® in evaporative trays. Dilute TwinOxide® in clean water and fill evaporative trays and place in the hatcher. Allow to evaporate as a straight replacement for formaldehyde.

GENERAL INFORMATION ON CHLORINE DIOXIDE

Chlorine dioxide offers a *practical* alternative to improved product quality. Current experience has shown that ClO₂ used effectively at the following rates.
Evisceration lines 0.1 – 0.5ppm
Chiller Tanks – 0.3 – 0.7ppm in final wash tank.

There has been a rapid expansion of the use of chlorine dioxide in poultry processing since the recent approvals

granted by the FDA in the USA. The initial approval permitted a 3ppm residual in poultry chiller water (Regulation 21 CFR Part 173.69).

This was subsequently amended to allow for greater use of chlorine dioxide. Under an approval (Vol 61, No 079 61 FR 17828, 23/04/98) carcass spray or dip water can be treated with the approved oxidants, acidified to pH 2.8 – 3.2 to produce chlorine dioxide levels of approximately 10 – 220 ppm. Prechiller or chiller tank water can be treated at levels in the range 10 – 30 ppm chlorine dioxide. In giving notice of the amendment the FDA stated that " The agency has carefully considered the potential environmental effects of this action. FDA has concluded that the action will not have a significant impact on the human environment and that an environmental impact statement is not required. (Environmental impact would include any level of detectable chemical residues on product following treatment).

Researchers the University of Arkansas have demonstrated that compared with chlorine and tri-sodium phosphate chlorine dioxide consistently provides more control over E. coli and coliforms, Campylobacter jejuni and Salmonella typhimurimum. Chlorine dioxide has also been found to eliminate cross contamination of Salmonella typhimurimum in chill water tanks.

In the USA it has been found that when the chilled water is treated with up to

3ppm of chlorine dioxide that the shelf life of the product was extended by between 1 and 4 days. No adverse effects on carcass appearance have been noted and sensory analysis of treated product revealed no differences in overall like or dislike or flavor ratings.

Extensive commercial trials have confirmed the effectiveness of chlorine dioxide. Two commercial broiler processing plants evaluated carcass rinse and chill water samples for aerobic plate count. A chlorine dioxide residual of 3ppm was maintained in the chill tank where carcasses were held for 45 – 60 minutes. Populations of E. coli, coliforms, Campylobacter jejuni, Staphylococcus species, Salmonella and Listeria were all reduced by at least 90% and in most cases were below the minimum detectable levels. After chilling treated carcasses exposed to chlorine dioxide had total bacterial populations 68 to 90 lower than carcasses treated with 25 to 40ppm chlorine.

Chlorine dioxide has been used for many years in controlling bacteria in flume waters used in the fruit and vegetable industries because of its broad spectrum of microbial control achieved without harmful effects on the taste or appearance of the products. Because chlorine dioxide is very versatile a single installation can be used to treat process water, cooling waters and odor scrubbing systems.

EFFECT OF CLO₂ ON BROILER CARCASSES AND CHILLER WATER

	Aerobic Counts, PM		Salmonella		
	Mean log10/ml water	Mean log10/g carcasses	+ve / Total Water	+ve / Total chilled carcasses	Mean Shelf Life / Days
Untreated	3.41	4.83	6/25	8/56	20.5
34 ppm Cl ₂	2.72	3.97	0/44	2/44	32.3
5 ppm ClO ₂	2.89	3.88	0/48	1/96	27.3
20 ppm Cl ₂	3.02	3.75	9/52	1/52	28.2
3 ppm ClO ₂	2.95	3.72	12/48	1/48	35.0

(1) HS Lillard, Poultry Science 59, 1761-1766 It was noted in the above study that contamination levels of the chiller water was higher in the afternoon than the morning, probably due to increased contamination with the length of use of the chiller. In another study, Thiessen et al (2) investigated chlorine dioxide for its efficiency in disinfecting poultry carcasses in chiller water.

SALMONELLA AND COLIFORMS ISOLATED IN CHILL WATER SAMPLES

Actual mg/l	ClO2 Level	Salmonella Prevalence / no tested	Coliform Count mean log10
0		8/10	3.14
0.49		0/2	1.70
0.51		2/2	1.46
0.86		2/2	1.15
1.33		0/2	0
1.39		0/2	0

⁽²⁾ Thiessen GP, Usbome W.R. and ORR H.L. Poultry Science (63) 647-653(1984)

- 1) Shelf life of the carcasses was significantly improved .
- 2) Due to the lower concentration of ClO2, corrosion is greatly reduced.
- 3) ClO2 is effective over a wide pH range in contrast to Cl2 which is 80 times less effective at basic pH's.
- 4) No detectable ClO2 residuals or its oxidative by-products remain on the carcass.
- 5) Any low level non-detectable ClO2 by-products remaining on the carcass will be converted to low levels of sodium chloride (table salt) during cooking.
- 6) No evidence of mutagenic activity noticed.
- 7) No increase in thiobarbituric acid values compared to tap water.
- 8) No oxidation of sensitive fatty acids compared to tap water.

TECHNICAL REFERENCES

Thiessen, Usborne and Orr. Elimination of Salmonella from large spin chiller tanks.

H. S. Lillard. Levels of Chlorine and Chlorine dioxide of equivalent Bactericidal Effect in Poultry Processing Water.

Journal of Food Production (1990) The use of a slow release Chlorine Dioxide source for the elimination of Salmonella on turkey carcasses.

P. H. Paterson, Ricke, Sunde & Schaefer. Hatching Eggs Sanitised with Chlorine Dioxide. Egg Hatchability and Bacterial Properties.

Emswiler, Kotula & Rough (Meat Science Labs. USDA Maryland. Comparison of Sodium hypochlorite, Calcium Hypochlorite and Stabilised Chlorine Dioxide on the Bacterial Populations on Beef Carcasses. (Journal of Animal Sciences Vol 42 No 6 1976).

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