



TwinOxide[®] in Poultry Farm Drinker Systems

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TwinOxide® provides many benefits as a disinfectant and sterilizer in the Poultry Industry. These benefits can roughly be divided into three main areas.

- ◆ Benefits of chlorine dioxide compared to other biocides and disinfecting agents, all of the benefits being equally applicable to, and valid for, TwinOxide®.
- ◆ Benefits of TwinOxide® compared to other forms and classic Chlorine Dioxide generation methods.
- ◆ Numerous application areas, microbiocidal efficacy and biosecurity provided by TwinOxide® in the Poultry Industry.

As mentioned, there are many areas where TwinOxide® finds applications as a disinfectant or sterilizer within the Poultry Industry, and provides significant benefits compared to other disinfectants. These applications range from the hatchery and egg handling, though breeding and farming, right through to processing the poultry for human consumption, which can basically be regarded as applications from “Egg to Table”. Hygiene and disinfection is imperative to ensure that infections and disease do not occur or passed on within in the poultry, and subsequently not passed on to humans. Within the Poultry Industry, TwinOxide® can be a principal and essential part of Biosecurity.

APPROVALS

TwinOxide® has many approvals for use in Food Industry and Drinking Water applications.

- ◆ Food Standards Australia New Zealand (FSANZ) approval for washing, peeling and disinfection.
- ◆ NSF International (NSF) and American National Standards Institute (ANSI) approval for treatment of drinking water.
- ◆ Hygiene-Institut des Ruhrgebiets, Gelsenkirchen, Germany, for contact with food and drinking water.
- ◆ United States Environmental Protection Agency (EPA) for use as a biocide.
- ◆ Kosher and Halal Certified.
- ◆ DIN EN 12671 2016 Chemicals used for treatment of water intended for human consumption - Chlorine dioxide generated in situ.

DRINKER SYSTEM APPLICATIONS

In all aspects of Poultry Farming, healthy birds are essential for profitable operation and biosecurity within the flock, farm operators, and consumers of the processed products. Of utmost importance is the quality of the water used within the farm and in particular the drinking water provided for the birds. “Clean Water”, essentially free from harmful microorganisms, viruses, pathogens, and biofilm is of paramount and vital importance.

Chlorine Dioxide, which is the active disinfectant obtained from a TwinOxide® Solution has been proven effective for the reduction and control of all microorganisms. These include bacteria, fungi, yeast, algae, viruses, pathogens protozoa and parasites. Chlorine Dioxide is, besides Ozone, the only suitable

disinfectant able to kill and remove Biofilms in Drinking Water Distribution System Pipes and Tanks.

Reduced Operating Costs and Increased Profitability

TwinOxide® has been applied for many years in numerous Poultry Drinker System Applications. The change to TwinOxide® in these applications has resulted in cost savings and increased profitability of the Poultry Farms.

Results from one application which changed to TwinOxide®, compared over the same period of time to an equal number of sheds using the incumbent disinfectant protocol, resulted in a Live Weight (LWT) increase of 0.75%, and a Food Conversion Rate (FCR) decrease by 0.99%, meaning that less food was required to obtain a given increase in weight of the birds. Even though the TwinOxide® treatment incurred a marginal increase in operating costs for disinfection, overall operating cost per kilogram of LWT was reduced by 0.093%.

Although these percentage variations may seem small, they relate to 40 sheds, 20 sheds with Drinker Lines treated with TwinOxide® and 20 sheds with Drinker Lines treated with the incumbent disinfection program. The comparison was over a period of 7 Batches or 14.5 months, and each group of 20 sheds contained about 3,100,000 birds. On an annual basis, adjusted to 5.8 Batches per year, these improvements obtained with TwinOxide® equate to operating cost savings of US\$ 67,500 per year and increased revenue from the meat, after processing, of US\$ 76,500 per year, yielding an overall increase in profit of US\$ 144,000 per year. Following these positive results, application of the TwinOxide® Treatment Program was extended to all Sheds on all Farms within the Group, which extrapolates to an increased profit of significantly greater than one million US\$ per year.

PREPARATION AND USE OF TWINOXIDE®

TwinOxide® technology has been specifically designed to provide a safe, easy and efficient method of disinfecting water and surfaces with Chlorine Dioxide. First, a 0.3% Chlorine Dioxide Solution is prepared by filling a suitable vessel with a specified volume of water. The Table below indicates volumes of solution that can be prepared using Standard Package containers or pails of TwinOxide® Component A and Component B precursors.

TwinOxide® 0.3% ClO ₂ Solution Required Liters	Weight (each) of Component A and Component B Kilograms	TwinOxide® 0.3% ClO ₂ Solution Required US Gallons (nominal)	Weight (each) of Component A and Component B Pounds
10 liter	0.2 kg (200 g)	2.6 gal (2.5 gal)	0.44 lb (7 oz)
25 liter	0.5 kg (500 g)	6.6 gal (6.5 gal)	1.1 lb (18 oz)
50 liter	1 kg	13 gal (15 gal)	2.2 lb
100 liter	2 kg	26 gal (25 gal)	4.4 lb
200 liter	4 kg	53 gal (55 gal)	8.8 lb
500 liter	10 kg	132 gal (130 gal)	22 lb
1000 liter	20 kg	264 gal (265 gal)	44 lb

The contents of the Component B container are added to the water in the vessel, followed by the contents of the Component A container. The mixture is allowed to stand undisturbed for 2 to 3 hours to allow reaction to form Chlorine Dioxide to be complete, after which the solution should be gently mixed and is then ready for use.

Using a metering pump, TwinOxide® 0.3% Chlorine Dioxide Solution is dosed into the system or water to be treated at a rate to obtain the target Chlorine Dioxide Disinfectant Residual concentration required in the water. Sometimes two vessels are used. One for preparing the TwinOxide® 0.3% Chlorine Dioxide Solution and subsequently from which the solution is dosed, and a second vessel to prepare a second batch of TwinOxide® 0.3% Chlorine Dioxide Solution for use when the previous batch is consumed.

Poultry Drinker System Treatment

TwinOxide® Maintenance Disinfection Program

The concentration of Chlorine Dioxide, and subsequently TwinOxide® 0.3% Chlorine Dioxide Solution, required depends upon many factors. A prime factor is the source, quality and microbiological loading of the water used in the Drinker System. Another important factor is the condition of the Drinker System, particularly the presence of biofilm in the system. Certain contaminants in the water can react with Chlorine Dioxide and create a "demand" which has to be "satisfied" before a residual disinfectant concentration can be obtained. A typical application would be to maintain a continuous residual disinfectant concentration in the water of between 0.2 and 0.6 ppm ClO₂.

Clean-Up and Biofilm Removal Program

If a system contains biofilm then a clean-up program to remove the biofilm would be advisable. One type of clean-up program entails shot dosing TwinOxide® 0.3% Chlorine Dioxide Solution into the system, when the shed is de-populated, to obtain a residual disinfectant concentration of 10 to 30 ppm ClO₂ throughout the system. The water containing disinfectant would be held in the system for 12 to 24 hours. During this time, at these concentrations the system should be thoroughly sterilized, and biofilm killed and loosened. The system should then be thoroughly flushed to remove biofilm and water containing disinfectant. After this, the Drinker Water would be returned to a normal maintenance treatment with TwinOxide® and birds placed into the shed. This type of program should only be required as a one-off process to clean a dirty system or after there has been an upset or disruption of the normal maintenance program that has initiated biofilm formation.

Another method that can be used to clean-up dirty systems and remove biofilm is to apply much low residual concentrations of disinfectant over a period of several weeks. These low residual disinfection concentration clean-up programs can be performed while the shed is populated with birds. One example of this type of program is to dose TwinOxide® 0.3% Chlorine Dioxide Solution to obtain and maintain a residual disinfectant concentration of 1 ppm ClO₂ throughout the entire Drinker Water

distribution system. This residual disinfectant concentration would be maintained for 2 to 3 weeks. After this, the residual disinfectant concentration would be reduced to a normal maintenance concentration of 0.2 to 0.6 ppm ClO₂.

CHLORINE DIOXIDE COMPARED TO OTHER BIOCIDES

In Food Industry applications where food may be in contact with a disinfectant or in contact with water containing a disinfectant, Oxidizing Biocides are more commonly approved and used, rather than Non-Oxidizing Biocides. The same preference applies to the treatment of drinking water.

Provided they are approved for the proposed application, several types of Oxidizing Biocides that may be considered. These include Chlorine, Bromine, Iodine, Halogen Donors, Chloramine, Chlorine Dioxide, Peroxides, and Ozone.

Traditionally Chlorine, in the form of Chlorine gas or Sodium Hypochlorite, has been used, basically because it is effective against most microbiological organisms, and is relatively low cost. When used as a biocide or disinfectant, Chlorine, and Bromine, based Oxidizing Biocides react with Organic Compounds that may be in the water, to form Halogenated Hydrocarbon Compounds. There are several Halogenated Hydrocarbons that may be formed, the majority of which can be broadly classified as Trihalomethanes (THMs), Haloacetic acids (HAAs) and Mutagen-X (MX). These compounds are harmful to the environment, and some are carcinogenic.

BENEFITS OF TWINOXIDE[®]

TwinOxide[®] 0.3% Chlorine Dioxide Solution provides many important benefits compared to Chlorine.

- ◆ Simple, easy and safe preparation and dosage of disinfectant.
- ◆ Solid precursors, therefore low risk of "spreading" in the event of leakage or spillage of precursors.
- ◆ Non-fuming precursors.
- ◆ No THM or HAA formation.
- ◆ Efficient and rapid disinfectant.
- ◆ More effective biofilm control and removal.
- ◆ Effective on all types of microorganism.
- ◆ Low residual disinfectant concentrations.
- ◆ At use concentration, no corrosion of commonly used metals, and compatible with most plastics and elastomers.
- ◆ Minimal Capital Investment