


BVS PULTRY

Best Veterinary Solutions, Inc.

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www.bestvetsolutions.com



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MEETINGS & EVENTS:

- National Turkey Federation Annual Convention
February 11-14, 2015
Caribe Hilton | San Juan, Puerto Rico
- Midwest Poultry Federation Convention
March 17-19, 2015 • Saint Paul, MN
- Iowa Turkey Federation Summer Meeting
June 9-11, 2015
- MTGA Summer Conference
June 17-19, 2015 • Chase on the Lake Resort | Walker, MN

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Why Chlorine Dioxide Should be Your Choice for Water Sanitation

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Chlorine Dioxide technology has really taken off over the past couple of years in the poultry industry and has shown to be a great alternative to Chlorine and even stabilized Hydrogen Peroxide for continuous water sanitation. As we have tried to utilize the Chlorine Dioxide technology there are a lot of things we have learned along the way. I still think there are plenty of things to learn about this technology and I certainly don't know all of it but I am going to share some of the things I know about Chlorine Dioxide and why I feel it is the best choice for water sanitation / disinfection on your farm.

I have continuously seen this technology used incorrectly on the farm while growers think they are using Chlorine Dioxide they truly are not. There are a lot of different opinions on how to administer this technology correctly. I am going to go over some of the things I have seen on the farm and how to properly use Chlorine Dioxide that I have seen work better than most alternatives.

There are a lot of reasons why people have started to use Chlorine Dioxide (disclaimer: I will continue to refer to Chlorine Dioxide as CLO2 for the rest of this article) as their choice for water sanitation. CLO2 is chemically quite different from Chlorine. CLO2 only has 2/3 the oxidation potential of Chlorine or stabilized Hydrogen Peroxide but it has 2.5 times more oxidation capacity compared to both of those chemicals. CLO2 is NOT pH dependent like Chlorine and can disinfect your water from a pH of 2 to 10. It is far less corrosive on equipment compared to Chlorine. CLO2 can work on and eliminate biofilm, take out sulfur odors and helps eliminate mineral build up and filtering / removing iron out of your water becomes more effective. The biggest reason why CLO2 has become more popular is *most* products on the market are EPA registered and have claims to 'disinfect water supply for poultry, swine, cattle and other livestock'. Most chlorine products are not EPA registered to run with poultry present and **NO** stabilized hydrogen peroxide product is EPA registered to run with animals present on a continuous basis to disinfect the water supply.

Most CLO2 products on the market are purchased in the Sodium Chlorite form and are not actually Chlorine Dioxide. This is very important to understand

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Chlorine Dioxide for Water Sanitation, *continued from cover*

when trying to utilize these products to their fullest potential. Depending on the percentage of CLO₂ you buy will depend on what percentage of Sodium Chlorite is in the jug or drum. If you buy a 'stabilized' 5% Chlorine Dioxide product (Pro Oxine, Anthium Dioxide, MaxKlor), you are actually getting a 8.35% Sodium Chlorite product in that jug or drum. If you buy a 2% CLO₂ product (Oxine), you are actually getting a 3.35% Sodium Chlorite in that jug or drum. It is essentially a 1.67 multiplier from the percentage of CLO₂ that product claims.

Sodium Chlorite is widely used as a sanitizer and can be effective at inhibiting bacteria. It is important to know that chlorite solutions can carry anti-microbial claims listed as static or stasis by the EPA. That means chlorite solutions can inhibit or prevent bacteria growth of present organisms. It is also important to know that Sodium Chlorite solutions are NOT Chlorine Dioxide. If you use the product straight from the jug without 'activating' the product you are using Sodium Chlorite technology NOT Chlorine Dioxide. In order for the product to become biocidal and make disinfecting and sterile claims you have to show efficacy with activated product. Activated product is the process of taking the Sodium Chlorite solution and changing some of that chemistry to Chlorine Dioxide. The 'activation' step is the part of CLO₂ I believe gets misunderstood the most when working with these products and generally results in no activation taking place or needing to run the product over label usage rates to achieve some activation to generate CLO₂.

There are many ways the EPA allows Sodium Chlorite to be 'activated' to CLO₂. The most common and effective 'activator' that is used to convert chlorite to CLO₂ is generally a single acid product like Lph 100 which is FDA & USDA approved and is safe for well and ground water (LpH 100 has a trade name of Acidic Calcium Sulfate) or some kind of liquid inorganic acid. You can also use Citric Acid (liquid or dry) and that can be effective but we have found the liquid inorganic acids like LpH 100 work best and allow for less acid to be used with higher conversion to CLO₂.

When working with Sodium Chlorite solutions and using an acid as your 'activator' it is important to understand that there are TWO dynamics that determine the percentage of conversion you achieve from Sodium Chlorite to CLO₂. Contact time with your acid or 'activator' and pH of the working solution your acid is creating. Those two dynamics will determine how much Chlorine Dioxide you actually generate. If you do not allow enough contact time with your 'activator' and the pH of the solution is not low enough you will get little to no activation generating no biocidal activity in your water. If you do not have biocidal activity you are not truly 'disinfecting' your water supply as per the label statement.

Simply mixing the two components together without adequate "dwell time" for activation results in little to no CLO₂ being generated. The common practice of injecting the acid or activator through one pump and injecting the chlorite solution through another pump and introducing the two products in the water line is grossly inadequate for allowing the proper activation time to convert the solution to a preferred % of CLO₂. Mixing the chlorite solution and acid into a 'T' station before entering the water system has shown to work in some cases at generating CLO₂ but is very inconsistent and takes a tremendous amount

of acid to generate some or if any CLO₂. The times you are able to generate CLO₂ your total working solution is generally much higher than what label usage rates allow or you need to use so much acid (2 or 3 parts acid for every 1 part of chlorite) it burns off all the 'TOTAL' solution only leaving some residual 'FREE' which makes the overall product not as stable to be effective in water lines from injection point to the end of your water line. Remember these are EPA registered products and running them at label usage rates is very important to follow.

When using 5% stabilized CLO₂ products like Pro Oxine after you achieve proper activation you will convert about 25% to 30% of that solution to CLO₂. 70 to 75% of that solution will remain chlorite and be a part of your TOTAL working solution. The remaining sodium chlorite is important and will play a critical role in how well your product works over time. Only converting 25% of your overall solution to CLO₂ is NOT a bad thing. The TOTAL working solution only tells you how much 'potential' active solution you could have. Your TOTAL solution in truly only telling you how many ppm's of sodium chlorite you have in the water. When you see the label on these products that tell you to run up to 5 ppm of total solution that is telling you nothing in terms of FREE CLO₂ (activated product) and is referring to total sodium chlorite solutions. Most labels allow up to 5 ppm of total working solution and out of that working solution you want to generate around 1 ppm of FREE CLO₂. Being able to measure some FREE CLO₂ in your water is the most important part of utilizing CLO₂ technology properly. However it is important to have a good working solution ratio between TOTAL and FREE. The TOTAL solution plays a key role in allowing the product to stay stable and effective from the injection point to the end of your water line which is key for a good water sanitation program. Plus having a good TOTAL solution will allow for some sanitation in your water lines when using other supportive care products that may neutralize the FREE component of your solution which I will explain later.

It is also important to note there is a difference in 'tech' grade chlorite products compared to in house generated chlorite solutions like Pro Oxine. Bio-Cide who is the manufacturer of Pro Oxine is able to manufacture formulations that are of very high purity through an in house patented process. This expertise in manufacturing also makes BCI one of the only chlorine dioxide producers whose products are FDA approved for human pharmaceutical use. Other 'manufacturers' of 5% chlorine dioxide products buy their chlorite solutions from other manufacturers to make their 5% chlorine dioxide products. Biocide generates in house chlorite solutions and then makes their own 5% chlorine dioxide product. Simply put 'tech' grade chlorites use different buffers and stabilizers to generate their chlorite solution making it more difficult to properly activate and generally needing a more aggressive acid and more total acid to achieve activation. Pro Oxine's product is buffered to an 8 to 8.5 pH solution while most tech grade products are buffered between a 9 to 10 pH solution, therefore the higher pKa acids perform poorly with tech grade chlorites. That is why you generally need more chlorite and more acid to generate FREE CLO₂ with tech grade chlorites. Remember the two dynamics: Contact time and pH of your working solution. You want your working solution to generally

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Chlorine Dioxide, *cont. from pg. 3*

be around 2 to 2.5 pH for it to be effective at generating FREE CLO₂. One can simply look at the products labels to see the difference. With tech grade chlorites it calls for at least 15 minutes of contact with your acid or 'activator' before being administered into the water system. With Pro Oxine it calls for 10 minutes of contact time before being administered into the water system. This means it was able to generate the FREE component of the solution (actual CLO₂) quicker. Pro Oxine was also able to get a FREE component at a lower TOTAL solution. Pro Oxines label shows it was effective at 3 ppm while tech grade chlorites show they were effective up to 5 ppm TOTAL solution to generate any biocidal or FREE activity. Remember you need the FREE component to generate any disinfecting properties in your water system. If you have 5 ppm TOTAL solution with no FREE activity you are essentially just running chlorite solution and not CLO₂.

PROPER ACTIVATION IS THE KEY:

Unfortunately there are no perfect products and every product does have some draw backs. On farm activation (generating CLO₂ from Sodium Chlorite) as mentioned earlier has seemed to be the biggest hurdle in using CLO₂ properly and effectively and is the biggest issue when trying to use CLO₂ technology. To achieve enough 'dwell' time and pH in your solution you can manually mix the two products together but this creates a very unfriendly environment for the users due to the CLO₂ gas that is created when activating the product. Bio-Cide International has come up with a very user friendly way of properly activating the solution before entering the water system that does not require manual mixing. Bio-Cide's AANE system which stands for Automatic Activation Non Electric is a government patented system to deliver product without ever having to mix products but allows for proper contact time and pH in your working solution to generate FREE CLO₂ in your water system. The system is very easy to set up and can be used with any pump system you already have on your farm including a 1:128 medicator. We generally recommend using a Stenner pump system with a Flow Meter pulsing to the pump. Having the pump run off the flow meter allows for consistent amounts of product being injected into the water system and using a Stenner pump allows you to adjust the amount of product being injected into the water system. Each farm has different water so that will determine the amount of total solution required to achieve free CLO₂ in your water system. We have been able to get consistent FREE CLO₂ readings of up to 1 to 1.25 ppm FREE CLO₂ while only having 3 to 4 ppm TOTAL solution. This system allows for very little acid being used to generate CLO₂ and requires fewer product to be used to achieve desired results. Below is a picture of an AANE system set up on a farm with a Stenner pump and flow meter.

I have found that a 'T' system or introducing the acid and chlorite solution directly into the water line does not allow for consistent TOTAL and FREE readings. Sometimes it requires TOTAL solutions up to 10 or 15 ppm to achieve any FREE in your water line and most times you do not get any FREE readings at all. If you do get FREE readings it usually requires 5 to 6 times the amount of acid required to achieve any FREE

levels in your water. These systems make it very difficult to manage your conversion on a consistent basis.

When testing for ppm levels you can use 3 different things. Test strips: Remember most test strips will only tell you what your TOTAL solution is in the water. Test strips are not good to test for FREE CLO₂. They are essentially testing the Sodium Chlorite solution in your water. Reagent Test Kit: Test kits can test for both TOTAL and FREE but are generally not very accurate for testing the levels of FREE we are looking for on the farm. Spectrophotometer: These are the best for testing FREE CLO₂ levels in your water. They can accurately test levels of FREE from .05 to 5 ppm. I recommend at least 1 ppm FREE and 3 to 4 TOTAL. Some EPA registered products like Pro Oxine also have potable drinking water claims on their label. Meaning it is safe and allowed for human drinking water as well. The levels allowed for human drinking water are different then what is allowed for poultry or livestock drinking water. The potable water claim on Pro Oxine is up to .8 ppm FREE with a residual of up to 1 ppm chlorite solution. So you can essentially have 1.8 ppm TOTAL and .8 ppm FREE under the potable water claim approved by the EPA. The potable water claims are very tricky to understand but if you have a system on your farm that also connects to human drinking water you need to make sure that the water being used for human consumption falls under the potable water usage amounts. Pro Oxine and other products also have NSF clearance and approvals for potable water of up to 10 ppm TOTAL solution. However it is my understanding that any EPA claim or clearance on the products label would trump the NSF clearance or claim for that product.

THE BEST THING ABOUT CLO₂ FOR POULTRY GROWERS:

One of the biggest reason I like CLO₂ technology over other products is because of CLO₂'s ability to be a 'selective' oxidizer when working in your water system. As I mentioned earlier CLO₂ has 2.5 times the oxidation capacity compared to Chlorine or stabilized Hydrogen Peroxide. The reason CLO₂ has 2.5 times the capacity is because CLO₂ is a 'selective' oxidizer meaning it is not greatly affected by 'organic matter' or other containments in the water which allows it to be useful at much lower ppm's or dilutions in your water system. CLO₂ can generally be effective at 5 ppm TOTAL and 1 ppm FREE residual activity in your water. Hydrogen Peroxide will oxidize a wide spectrum of substances in your water line which will not always be beneficial and thus Hydrogen Peroxide generally needs to be run between 25 to 50 ppm residual activity for it to be effective. Because Hydrogen Peroxide oxidizes a wide spectrum of substances in water it is generally not recommended to run any other product if you are using Hydrogen Peroxide as your continuous sanitizer. If you want to run Vitamin D for example while using Hydrogen Peroxide the peroxide will most likely oxidize out the active ingredients in the Vitamin D before getting to the bird rendering the product useless. The same is true for a lot of other products. That is why you most likely see reactions and plugged lines or nipple drinkers if you run Hydrogen Peroxide with other products. Because you have to run higher ppm levels with Hydrogen Peroxide, the peroxide will oxidize those products creating an unfavorable environment in your water system and plug drinking lines. So if you want to run those supportive care products, which most growers like to do from time to time, you need to turn off your water sanitation to run those products. This will then compromise your water system by allowing biofilm and other bacteria to grow and thrive in your lines

which will then likely compromise bird health down the road. It has been documented that leaving your water sanitation off for 12 to 24 hours can create an environment for biofilm and bacteria to thrive and grow in your water system. This is also true for Chlorine / Acid, one or both needs to be turned off to run other supportive care products or water soluble antibiotics which negatively affect your overall water sanitation program. I think it has been well documented that a consistent water sanitation program is one of the best things a poultry grower can do to achieve better overall performance. Using stabilized Hydrogen Peroxide or Chlorine doesn't allow you to achieve that consistent program.

When utilizing the CLO2 technology you never have to turn off your system to run other supportive care products or water soluble antibiotics. Since CLO2 is a 'selective' oxidizer it doesn't seem to negatively affect these other products because CLO2 can be effective at much lower ppm levels and the other products don't negatively affect the TOTAL solution of the CLO2. I have documented TOTAL and FREE solutions in grower's water lines while they are running other supportive care products with CLO2. I have found that some products like penicillin or Biosupreme L will affect the FREE readings and I have found that some products like Manage, LC Energy or a vitamin pack do not affect FREE readings. Having said that I have not found a product that will affect the TOTAL solution to a point where you don't have some sanitation properties in your water line while using those products which is the key. Although the FREE component will be negated when using some products, which again means no biocidal activity, you still will have a TOTAL reading (sodium chlorite) which means you have some anti-microbial or static activity while you are using those products. This at least gives preventative sanitation properties while using soluble products through water line administration which is much better than other products like hydrogen peroxide or chlorine since you have to completely turn them off to run most of these supportive care products. Also as mentioned earlier the TOTAL and FREE components of the solution will *not* affect the efficacy of soluble antibiotics or supportive care product unlike stabilized hydrogen peroxide or a chlorine / acid administration. The **ONLY** time you need to turn off your CLO2 system is when you want to vaccinate or run a probiotic. It is still necessary to turn off your system when using a live organism like a vaccine through your water system. However, with the advancements in vaccine stabilizer technology it should allow you to have your CLO2 system off for no more than 12 hours to run these types of products. This to me is a **HUGE** advantage of CLO2 over other water sanitizers and something that gives the growers more freedom without compromising their water system. In a perfect world a grower would never have to run a supportive care product or a soluble antibiotic in the water line however from time to time stuff happens. Utilizing CLO2 as your water line sanitizer allows you to use those products and not compromise your water system to the point you are creating more problems than you are trying to solve. When using other supportive care products never mix them in the same solution or bucket with your chlorite and acid solutions. Always run the products through a separate pump or medicator.

The fact that you can consistently run your CLO2 system while utilizing other supportive care products is one of the best things that has happened to a poultry grower in a long time. One of the biggest challenges for growers is to keep their water sanitation program consistent and keep it running from start to finish. The AANE system allows for growers to set up a water sanitation system that utilizes the CLO2 technology properly and

keeps it simple for them to use on their farm from START to FINISH which is the key to any water sanitation program. As I mentioned at length in this article there is a lot to understand about CLO2 and how to properly use those types of products. We are all still learning and as time goes I am sure more will change with these types of products. I do know that the key to using ANY CLO2 technology is **MANAGING** your percentage of conversion from chlorite to chlorine dioxide. If you can properly manage those two dynamics you will have consistent results and success with CLO2.

It is kind of like Apple's technology, just wait 6 months and something new or different is on the market. I know reading this article may have probably made things more confusing but there are people that can help. Contact your local BVS representative and they can help sort through the difficulties of understanding CLO2 and how to best utilize its technology. As I have worked with this technology and have seen first-hand what it can do for growers overall performance including helping with respiratory diseases and improving their overall water sanitation program, there is no doubt that CLO2 is the best option for any poultry grower. As time goes I know we will continue to find ways to better utilize this technology on the farm.

*Example of the AANE system set up on a farm using a Stenner pump. Note: Only one Stenner pump is necessary and being used with this system. They had two set up because the farm was using Chlorine and an acid before Pro Oxine.

The AANE system has a 15 gallon tank that acts as the holding tank allowing for proper activation before entering the water system. The AANE set up has two 'floats' in the tank that allows you to determine how much solution you want mixed up at one time. Once the solution gets to a low enough point, the system automatically kicks on mixing fresh water through the hose attachment, Pro Oxine and LpH 100 or the acid. Once it mixes enough product, which is determined during set up, it will stop and that solution will sit and 'activate' before entering the water system. The Stenner pump tube put down into the 15 gallon tank and based on settings and water flow will inject the activated solution into your water line. Once the solution is mixed it can work off that solution for 3 or 4 days depending on water consumption and usage on that farm. Most growers will set this up at a point that will treat the entire farm or complex so only one system is necessary. Once the system is set you never have to mix or touch the system again. You only have to replace the empty jugs when necessary. ●

