Improving the World of Disinfection

GO_2™ APPLICATION BRIEF

GO_2™ A WIDE-SPREAD DISINFECTANT FOR THE SWINE INDUSTRY

What is GO_2?

GO_2™ is the 21st Century replacement for environmentally harmful chlorine, which has been in use for over a century to disinfect drinking water. GO_2 is an advanced chemistry to generate chlorine dioxide (ClO_2) in solution with a purity of 95.0+%. Pure ClO_2 is ten times more powerful as an oxidizing biocide than chlorine and chlorine-type disinfectants. GO_2 creates zero disinfection byproducts, (DBP's), including carcinogenic chlorine, chloramines, chlorites and chlorides. GO_2 kills most water-borne micro organisms. These include bacteria, including coliform, salmonella, listeria, E-coli, cinobacteria, viruses, yeast, fungi, mold, algae, spores, protozoans, cryptosporidia, actinomycetes, cysts, giardia, legionnaire's disease, cholera, dengue, hepatitis and typhoid. GO_2 also kills airborne viruses when misted into air or used on contaminated surfaces via HVAC or spray system distribution, including anthrax, influenza, SARS, smallpox, chickenpox and avian flu. The range includes not only viruses which infect humans but viruses that kill poultry, fish and livestock. GO_2 also removes phenols, cyanides, iron, manganese and ethnogeny from water. GO_2 eliminates microbial slime from water distribution and storage systems, whether this contamination is in a simple village well, a farm drinking water or irrigation system.

GO_2 Applications in Swine Industry

The importance of drinking water quality for the production and performance of pigs is often overlooked and underestimated. Pigs consume 4 to 6 times as much water as feed. Sows consume as much as 10+ gallons of water per day. Without an adequate supply of good quality water, pig growth and reproduction can suffer. The key is not just the adequate supply of water, but good quality water.

Water can be a source of contamination if the microbiological load in the water is too high. This can also affect digestion and absorption of nutrients from the feed, as well as additives like medications, vaccines and vitamins. Health issues linked to, but not limited to, drinking contaminated water include transmissible gastroenteritis (TGE), pneumonia, diarrhea, salmonella, listeria, typhoid, cholera and hepatitis.

Routine drinking water additives, like vaccines and vitamins contribute to a polysaccharide layer inside the drinking lines, commonly called "slime". The micro-organisms attach to the inside of the line and develop and flourish within this layer. The waterborne bacteria are difficult to kill due to their protective cell wall and encased protection within the slime. Most water treatments and disinfectants, including chlorine, cannot penetrate or degrade the cell wall, nor penetrate and eliminate the slime.
Routinely washing drinkers and flushing water lines is not sufficient because these practices do not remove the source of the problem inside the drinking system. Even with "good quality water", problems effecting health and performance can occur because the contaminants are inside the lines.

The ultimate water treatment product should:

- Remove the slime
- Destroy the micro-organisms in the lines
- Prevent any new build-up of slime
- Reduce the microbial population to a very low level
- Leave no residues that can accumulate in the meat

The above leads to healthier, better performing pigs with lower overall costs.

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GO_2™ is manufactured in the United States

US EPA Reg. No.: 84912-2
US EPA Est. No.: 66397-OK-1

APP.013.01.en.090610

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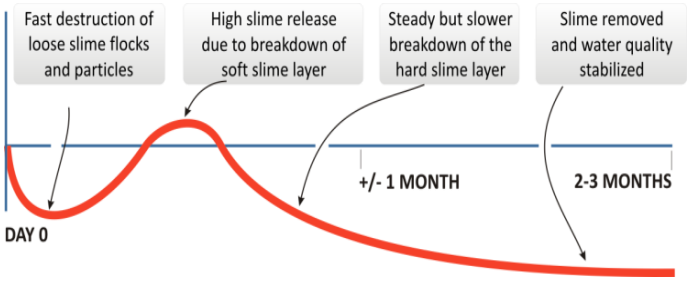
GO_2™: A WIDE-SPECTRUM DISINFECTANT FOR THE SWINE INDUSTRY

GO_2 is manufactured in powder form. Two component powders mixed in tap water on-site produces a 95.0+% pure chlorine dioxide solution (ClO_2) within 90 minutes, at a concentration of 4,000 ppm. The concentrate is simply dosed into the drinking water system.

GO_2 is the 21st Century replacement for environmentally harmful chlorine, a 150 year old chemistry. In treating human and animal drinking water, pure ClO_2 is ten times more powerful than chlorine and chlorine-type disinfectants. GO_2 removes odors, iron, manganese, phenols and cyanides from water and creates zero disinfection byproducts, such as free-chlorine, chloramines, chlorites and chlorides, which all affect poultry health. GO_2 is not corrosive to pipes, pumps and equipment and leaves no residue except trace amounts of common salt.

1. How ClO_2 removes slime

Slime in drinking water is a constant threat to livestock health. In Europe, thousands of growers use ClO_2 in livestock drinking water and houses. ATP readings have shown that the chart below is typical when using GO_2. There is no need for any other product to prevent slime. Slime is eliminated from the entire drinking system, which lowers the health challenge to pigs and improves their performance.



Minimal investment in equipment or infrastructure is required to use GO_2. The product is simple to use, transport and store. It has a shelf life of 3 years. One gallon of GO_2 will treat 40,000 gallons of water at 0.1 ppm. When mixed, the concentrate has an active life of up to 60 days.

GO_2 comes in dry-powder form 1.0kg (2.2 lbs) of component A and 1.0kg of component B produces 50 liters (13.2 gal) of 4,000 ppm chlorine dioxide. Large sizes are available. Only a dosing pump with a flow sensor (optional) and a mixing tank are required. GO_2 is a clean process. It is environmentally friendly and produces zero by-products.

2. GO_2 Applications in the Swine Industry

- Well water and drinking water treatment
- Potable water treatment with excellent slime control
- Facilities treatment: walls, floors, ceiling, equipment, fogging, etc.
- Truck cleaning for livestock transportation between farms.
- Bio-security Programs with consistent and on-going performance

3. GO_2 Key Features

- Easy and effective to apply
- Environmentally “GREEN” chemistry
- Treat and reduce slime and prevent its reformation in drinking and process water systems
- Carcass washing
- Improved production results and FCR
- Widely used as a water disinfectant for industrial, agricultural, municipal and consumer applications
- Competitive costs compared to conventional chemicals treatments

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4. GO_2 Cleaning Properties

- Higher yield. Up to 260% more oxidation power than chlorine
- GO_2 does not chlorinate organic materials
- Steady bactericidal efficacy within pH levels pH 3 to 10
- ClO_2 is 99.9% effective against most water-borne micro-organisms (Bacteria, Viruses, Protozoa, Fungi, Mold, Spores, Algae)
- ClO_2 does not allow build-up of resistance in micro-organisms
- Kills airborne pathogens when misted

5. GO_2 Chemical Properties

- Unlike chlorine, GO_2 does not react with ammonia, ammonium or most organic compounds
- Decreases THM's, HAA's, MX and other harmful compounds
- No free chlorine, chlorite, chlorate or chloride
- High efficiency in the removal of iron and magnesium

6. Grower's Benefit

Research was done in Canada on a pig farm with 4 houses and 16,000 pigs to compare conventional water treatment with GO_2 for pig growing. The following Tables show the results:

CONVENTIONAL WATER SANITIZER (IODINE)

ROOM	STARTING DATE	# of Pigs	STARTING WEIGHT (Kg)	ENDING WEIGHT (Kg)	MORTALITY (%)	GAIN per DAY (g)	FEED CONVER-SION RATIO
1	12/9/2008	1906	6.95	27.31	2.31	424	1.54
2	12/1/2008	2275	6.85	28.27	3.23	437	1.50
3	12/1/2008	2087	6.73	29.21	3.02	478	1.31
4	12/23/2008	2161	6.71	28.4	2.75	452	1.43
	Total:	**8429**					
	Average:		**6.81**	**28.3**	**2.83**	**448**	**1.45**

GO_2

ROOM	STARTING DATE	# of Pigs	STARTING WEIGHT (Kg)	ENDING WEIGHT (Kg)	MORTALITY (%)	GAIN per DAY (g)	FEED CONVER-SION RATIO
1	11/14/2008	1729	6.80	27.94	2.32	472	1.44
2	11/17/2008	2084	6.99	27.94	3.16	419	1.41
3	11/28/2008	2047	6.99	30.37	2.15	477	1.30
4	11/28/2008	1664	6.74	30.26	2.69	470	1.52
	Total:	**7524**					
	Average:		**6.88**	**29.39**	**2.58**	**460**	**1.43**

GO_2 ADVANTAGES:	ENDING WEIGHT	MORTALITY	GAIN per DAY	FEED CONVER-SION RATIO
	+ 2.82%	**- 8.8%**	**+ 2.68%**	**+ 2 points**

After the research period, the total profit increase for the grower was CN $16,436 (US $ 13,539).

7. Costs Properties

GO_2 is extremely cost competitive when compared by volume with other disinfectants. However, GO_2 delivers significant additional benefits which must be taken into account. These include:

- No corrosive effect on water distribution systems, equipment, pumps, pipes and filters
- No need for additional chemicals e.g. pH level stabilizers

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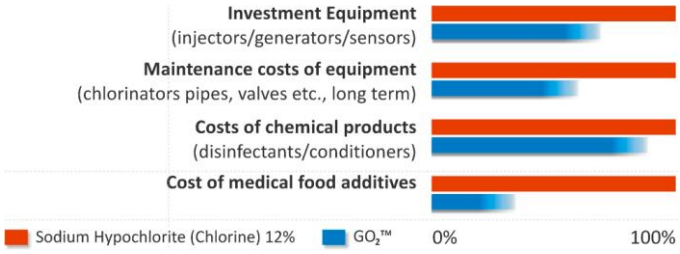
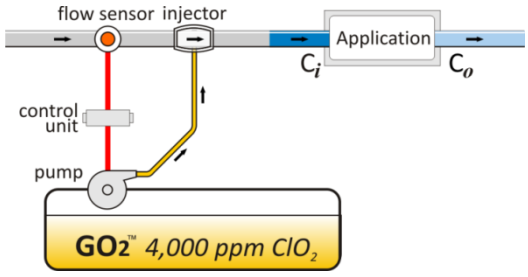
- No adverse environmental or ecological effects or known health and safety problems
- Complete slime reduction and control
- Reduced need for medicines and antibiotics
- Precise dosage management
- No risk of explosions
- Easy to use, transport and store (3 years shelf life of unopened powders packages)

The following slider graph gives an indication of comparison of the main grouped cost factors between Sodium Chlorite and GO_2 (depending on local conditions). A direct cost comparison by the volume of traditional disinfectants does not provide a realistic comparison with GO_2, as all side affect as mentioned above are traditionally not taken into account. The Total Cost of Disinfection is the cost of the chemical product, added to extra cost for maintenance and replacement of equipment, water conditioners and pH stabilizers, medicine and safety precautions, and training and insurance issues.



8. GO_2 Operation

- 3-year guaranteed shelf life (in unused and unopened jars/pails)
- Easy to apply (standard low cost industrial dosage equipment)
- High solubility in water; can be used in a very short time
- Up to 30 day shelf-life in activated solution
- Produces 95%+ pure ClO_2
- High yield rate, one gallon of GO_2 treats 40,000 gallons of water at 0.1 ppm
- No residues
- Non-corrosive at use dilution
- Easy and simple to use



To apply GO_2, the only equipment required is a storage tank, a flow sensor and dosing pump. These costs are minimal and eliminate the high investment hurdle required by conventional equipment-based CLO_2 generation technology.

GO_2 4,000 ppm concentrate can treat the following amounts of water at 5 pre-set concentrations:

4,000 ppm KIT for		1.0 ppm	0.5 ppm	0.3 ppm	0.2 ppm	0.1 ppm
13.2	**Gallons**	52,834	105,699	176,115	264,172	528,344
50	**Liters**	200,000	400,000	666,667	1,000,000	2,000,000
264	**Gallons**	1,056,688	2,113,376	3,522,942	5,283,411	10,566,882
1000	**Liters**	4,000,000	8,000,000	13,333,333	20,000,000	40,000,000

As of 2008, ClO_2 has been adopted in many countries as a water disinfectant. Customers from a variety of industries where clean water is essential include drinking water, waste water, food and beverage producers, bottled water companies, agriculture, horticulture, aquaculture, livestock, poultry, vegetable, fruit and produce washing, meat processing, the food industry, retail grocery chains, restaurants, the pulp and paper industry, the oil and gas industry, hotels, hospitals, cruise ships and marine vessels, military, swimming pools, hot tubs and spas, ornamental water, ponds and aquaria.

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9. ClO_2 Germicidal Spectrum

BACTERIA	
Pseudomonas Aeroginosa	Campylobacter Jejuni
Pseudomona Specie	Flavobacterium Species
Enterobarcer Cloaceae	Yersinia Enterolitica
Enterobarcter Hafnia	Clostridium Sporogenus
Proteus Vulgaris	Clostridium Dificile
Klebsiella Pneumoniae	Clostridium Perfingens
Salmonella Typhi	Fusobacterium
Salmonella Enteritidis	Bacilus Subtilis
Salmonella Gallinarum	Bacilus Circulans
Salmonella Typhimorium	Bacilus Megatarium
Salmonella Choleraesuis	Bacilus Cereus
Salmonella Typhosa	Bifedibacter Liberium
Corynebacterium	Staphylococcus Aureus
Sarcinae Lutae	Staphylococcus epidermia
Streptococcus Pyrogenes	Streptococcus Faecalis
Strep 1, 2, 3.	Mycobacteroi Bovis
Mycobacterium	Mycobacterium kansaaii

OTHER	
Vidrio Cholerae	Culex Quinquifasiatus
Mycoplasm	

FUNGI	
Candida Albicans	Trichophyton Rubrum
Scopulariosis Species	Aspergillus Niger
Trichophyton	Aspergillus Flavus
Mucor Species	Fusarium Specie
Saahromyces Cerevisiae	Fonsecaea Pedrosoi

VIRUS	
Herpes Virus I	Poliovirus
Herpes Virus II	Encephalomyocerditis
Adenovirus Echovirus	Vaccina Virus
Coxsakievirus	Vesicular Stomatitis Virus
Influenza	Para Influenza
Feline Parvovirus	Bluetongue Virus
Mouse Flu	Mouse Hepatitis Virus
Minute Virus of Mice	Mouse Encephalomyelitis
New Castle Disease Virus	Mouse Polio Virus (MEV)
Iridovirus	Pertiviries – Togaviridae
KHV, VHS, ISA	Hepatitis, Cholera,

Test Type	Test Organism	Contact Time	Result
9a	Aspergillus fumigatus spores	60 seconds	99.9999% kill
9b	Bacillus cereus Spores	5 minutes	99.999% kill
8f	Candida albicans	60 seconds	99.99999% kill
12	Canine Parvovirus	10 minutes	100% virucidal
	Erwinia carotovora carotovara	60 seconds	99.999% kill
1	Escherica coli	60 seconds	99.9999% kill
	Lactobacillus sp.	60 seconds	99.999% kill
3	Legionella pneumophila	60 seconds	99.999% kill
4	Listeria monocytogenes	60 seconds	99.9999% kill
	Listeria monocytogenes *(ATCC15313, Briel, Scott A)*	60 seconds	99.999% kill
	Mycobacterium bovis	10 minutes	> 6 log kill
	Newcastle Disease virus	10 minutes	100% virucidal
13	Pediococcus sp.	60 seconds	99.999% kill
10	Proteus mirabilis	60 seconds	99.999999% kill
	Pseudomonas aeruginosa	60 seconds	99.999999% kill
8a	Pseudo rabies virus	10 minutes	100% virucidal
5c	Saccharomyces cerevisiae	60 seconds	99.999% kill
11	Salmonella choleraesuis	10 minutes	100% kill
8c	Salmonella choleraesuis	60 minutes	100% kill
5a	Salmonella typhimurium	60 seconds	99.999% kill
6a	Staphylococcus aureus	10 minutes	100% kill
2	Staphylococcus aureus	60 minutes	100% kill
5b	Staphylococcus aureus	60 seconds	99.9999% kill
6b	Streptococcus faecalis	60 seconds	99.99999% kill
8b	Streptococcus faecium	60 seconds	99.9999% kill
8g	Trichophyton mentagro phytes	5 minutes	100% kill