



PURIFIER I

FIRST LIQUID ADDITIVE FOR CHLORINE DIOXIDE GENERATION

DESCRIPTION

PURIFIER I is an additive for chlorine dioxide in-situ generation. **PURIFIER I** is safe to handle, non-corrosive liquid additive engineered to yield high concentration of Chlorine dioxide.

APPLICATION

PURIFIER I is used *as is* and mixed with **PURIFIER II** at 1:1 ratio to yield more than 10,000 ppm of Chlorine Dioxide. For example, mix 1 Kg of **PURIFIER I** with 1 Kg of **PURIFIER II** for 5 minutes minimum; then dilute in 1000L water. This will yield 10 ppm of free Chlorine Dioxide in the 1000 L water.

ADVANTAGES

PURIFIER I has proved highly effective as a threshold chlorine dioxide generator. The outstanding effectiveness of **PURIFIER I** is proved by a multitude of practically orientated trials.

PROPERTIES

Appearance: Clear liquid

pH (1% solution): 9.00±1.50

Specific gravity @ 25°C: 1.10±0.050

PRECAUTIONS

Do not take internally. If ingested, give 3-4 glasses water or milk to drink and seek medical attention. **DO NOT INDUCE VOMITING.** If product comes in contact with eyes, flush for at least 15 minutes with a large amount of water. If irritation persists, consult a physician.

INGREDIENTS

Contains: Trade secret ingredients.

Made in Canada

DIS IN FECT PRODUCTS LTD
P.O. Box 338 Balmoral, Manitoba R0C-0H0

Information contained in this literature is believed to be accurate and is offered in good faith for the benefit of the consumer. The company, however, cannot assume any liability or risk involved in the use of its chemical products since the conditions of use are beyond our control.



PURIFIER II

SECOND LIQUID ADDITIVE FOR CHLORINE DIOXIDE GENERATION

DESCRIPTION

PURIFIER II is an additive for chlorine dioxide in-situ generation. **PURIFIER II** is composed of food-grade ingredients, it is safe to handle, non-corrosive liquid additive engineered to yield high concentration of Chlorine dioxide.

APPLICATION

PURIFIER II is used *as is* and mixed with **PURIFIER I** at 1:1 ratio to yield more than 10,000 ppm of Chlorine Dioxide. This solution should be used within few hours to ensure high yield of chlorine dioxide. Always prepare fresh solution. Do not keep the solution overnight,

ADVANTAGES

PURIFIER II has proved highly effective as a threshold chlorine dioxide generator. The outstanding effectiveness of **PURIFIER II** is proved by a multitude of practically orientated trials.

PROPERTIES

Appearance: Clear liquid

pH (1% solution): 2.00 ± 1.50

Specific gravity @ 25°C: 1.10 ± 0.050

PRECAUTIONS

Do not take internally. If ingested, give 3-4 glasses water or milk to drink and seek medical attention. **DO NOT INDUCE VOMITING.** If product comes in contact with eyes, flush for at least 15 minutes with a large amount of water. If irritation persists, consult a physician.

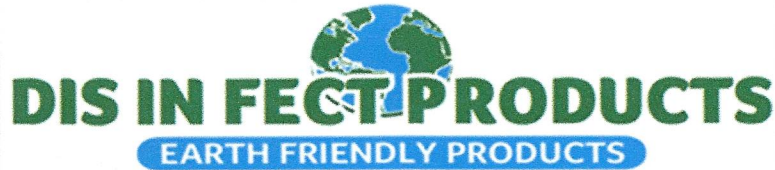
INGREDIENTS

Contains: Trade secret food-grade ingredients.

Made in Canada

DIS IN FECT PRODUCTS LTD
P.O. Box 338 Balmoral, Manitoba R0C-0H0

Information contained in this literature is believed to be accurate and is offered in good faith for the benefit of the consumer. The company, however, cannot assume any liability or risk involved in the use of its chemical products since the conditions of use are beyond our control.



PROTOCOL

CHLORINE DIOXIDE GENERATION USING: PURIFIER I & PURIFIER II.

Protocol:

Mix 1 kg of PURIFIER I with 1 kg of PURIFIER II for few minutes (5-15 min), then dilute in 1000L for example to generate 10 ppm chlorine dioxide.

The Chlorine dioxide is generated at a concentration of 10,000 ppm to 20,000 ppm. This stock solution is active for 6 hours.

If you want to use chlorine dioxide at 1-2 ppm for example, make a dilution of 1/10,000.

DESCRIPTION:

Chlorine dioxide (ClO₂) is a highly potent, fast acting bactericide and virucide that is effective at concentrations as low as 0.1 ppm.

Chlorine dioxide does not form toxic by-products and is effective over a wide pH range in both hard and soft water. It will eliminate both planktonic and sessile bacteria, disinfect surfaces and rapidly destroy problematic biofilm. These properties make it ideal for use in a wide range of water sterilization, disinfection, environmental hygiene, industrial and process water treatment activities.

Our range of advanced technology chlorine dioxide products deliver fast acting, superior microbiological control in a safe, convenient form. Our ClO₂ products include innovative chlorine dioxide tablets, two component powders and liquids

DIS IN FECT PRODUCTS LTD
P.O. Box 338 Balmoral, Manitoba R0C-0H0

Information contained in this literature is believed to be accurate and is offered in good faith for the benefit of the consumer. The company, however, cannot assume any liability or risk involved in the use of its chemical products since the conditions of use are beyond our control.



AREAS OF APPLICATION

This versatile chlorine dioxide powder delivery system has a range of applications including:

Food processing environments - very effective, food safe hard surface cleaner.

Healthcare and veterinary facilities - rapid action, highly effective hard surface cleaner.

General industrial and process water treatment applications including cooling systems, cooling towers (Legionella control), water storage tanks etc.

Re-circulating cooling water systems.

Reverse osmosis plant and membrane sterilisation.

Emergency drinking water purification.

Highly effective odour control.

Water softeners.

Vehicle and car washing facilities, controlling microbiological activity in recycled water systems.

DIS IN FECT PRODUCTS LTD
P.O. Box 338 Balmoral, Manitoba R0C-0H0

Information contained in this literature is believed to be accurate and is offered in good faith for the benefit of the consumer. The company, however, cannot assume any liability or risk involved in the use of its chemical products since the conditions of use are beyond our control.



PRODUCT BENEFITS

Ideal and very cost effective for small to medium users of chlorine dioxide

Effective against all water related micro organisms (bacteria, viruses, protozoa, fungi, yeast)

Very cost effective method of generating chlorine dioxide with minimal up-front investment costs in plant, equipment and training

The smell, taste and colour of drinking water improves

Less load on sewage

Reduction of residue in water

No resistance building by micro-organisms

Removal of Prophylaxis on biofilms

Fully operational at pH levels between 4 and 10

DIS IN FECT PRODUCTS LTD
P.O. Box 338 Balmoral, Manitoba R0C-0H0

Information contained in this literature is believed to be accurate and is offered in good faith for the benefit of the consumer. The company, however, cannot assume any liability or risk involved in the use of its chemical products since the conditions of use are beyond our control.



Chlorine Dioxide

Chlorine dioxide is used in water treatment applications as a disinfectant and as an oxidant.

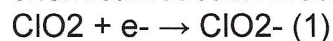
Chlorine dioxide is used to inactivate bacteria, viruses, and protozoa, and oxidize iron, manganese, hydrogen sulfide, and organic compounds.

Description of Technology

Technology Description

Oxidation is the mechanism for chlorine dioxide (ClO₂) disinfection. Chlorine dioxide is extremely soluble in water; approximately 10 times more soluble than chlorine. It is also very volatile and can be easily removed from dilute aqueous streams with minimal aeration. It is highly selective and effective at low concentrations.

Chlorine dioxide is a regulated Primary Drinking Water Contaminant. The Maximum Residual Disinfectant Level Goal (MRDLG) is 0.8 ppm and the Maximum Residual Disinfectant Level (MRDL) is also 0.8 ppm. When chlorine dioxide (ClO₂) is added to water, chlorite ions (ClO₂⁻) are formed. The chlorite ion is further reduced to the chloride ion by accepting electrons donated by other species in the water. This transfer of electrons causes the reduction of chlorite to chloride and the oxidation of other species. The following equations show the chemical reaction mechanism for chlorine dioxide oxidation:



Chlorite, a disinfection by-product, is currently limited in the NPDWR to a maximum concentration of 1 ppm in drinking water. The MCLG is 0.8 ppm. Therefore, chlorine dioxide should only be used for water sources in which a low ClO₂ dose is required or in applications which use iron-based coagulants since iron can reduce chlorite to chloride. The NSDWR limit for chloride is 250 ppm.

Chlorine dioxide cannot be stored or transported as a gas because it is extremely flammable. Liquid chlorine dioxide will dissociate into oxygen and chlorine when stored for long periods of time. For these reasons, chlorine dioxide is difficult to transport and is typically generated on-site from sodium chlorite and hydrochloric acid by the following chemical reaction:



Chlorine dioxide can be decomposed by exposure to sunlight. Tanks and piping must be opaque or shielded from sunlight.

Waste Disposal There is no waste stream produced from the generation of chlorine dioxide or the addition of chlorine dioxide as a disinfectant in water treatment applications.

Maintenance Routine maintenance is required on the chemical feed systems that dose the chlorine dioxide into the water stream and the chemical feed and mixing systems that generate the chlorine dioxide.

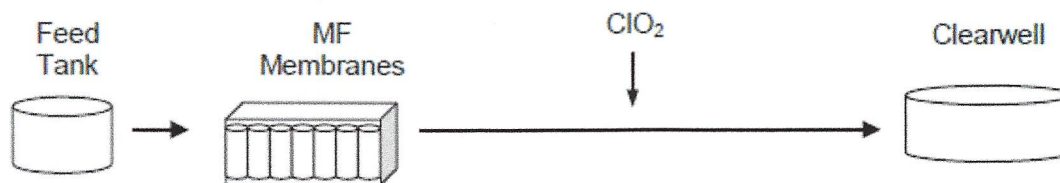
Benefits

- Established
- Low cost
- Reliable
- Effective as a primary disinfectant at low concentrations
- Few organic DBPs produced

Limitations

- Health and safety concerns from chlorine dioxide generation
- Chlorite monitoring required
- Sodium chlorite is expensive
- Not an adequate secondary disinfectant for residual due to its high volatility

Example Treatment Train



Safety and Health Concerns

Chlorine dioxide gas is extremely flammable and must be generated on-site and cannot be stored due to its high volatility. Chlorine dioxide generation can produce noxious vapors. Therefore, appropriate personal protective equipment and training is necessary for operators involved in chemical handling and maintenance of the chlorine dioxide generation and dosing equipment.

References

- 1 Water Treatment Plant Design, AWWA, 4th Edition, 2005
- 2 EPA Guidance Manual, Alternative Disinfectants and Oxidants – Chapter 4: Chlorine Dioxide, April 1999.