AQUAPULSE SYSTEMS

Chlorine Dioxide Generator

3-Chemical Process
Model APS-3T

- ✓ High Efficiency
- ✓ High Capacity
- ✓ Industrial Design
- ✓ Efficient Conversion
- ✓ Electronic Controls
- ✓ Built-in Safety
- ✓ Secondary Shut-down
- ✓ Built-in Data Recording
- ✓ Automatic Data Reporting
- ✓ Internet Connectivity
- ✓ Built-in Alarm Notification
- ✓ Alarm by Email and Text
- ✓ Data Management by ePulse®

$$2NaClO_2 + NaOCl + 2HCl \rightarrow 2ClO_2 + 3NaCl + H_2O$$

The APS Chlorine Dioxide generator is a safe and powerful "State of The Art" system that efficiently reacts precursor chemicals into the most efficient production of pure Chlorine Dioxide. Safety features, high efficiency, robust design and compact format highlight the superiority of the APS generators, and are integrated with automated status notification and secondary safety features. All APS generator designs directly interface with the APS Data management for ePulse® data service for monitoring and control of your water treatment.

The unique design of the 3-chemical chlorine dioxide generator mixes an acid, sodium hypochlorite and sodium chlorite to form a very high efficiency reaction to produce a high conversion ratio of aqueous chlorine dioxide solution. The proprietary eduction technique, along with precise dosing allows consistent and reliable production of chlorine dioxide solution within seconds.

A water source is connected to the inlet of the generator, which is regulated and controlled by a solenoid valve. An ultrasonic level sensor measures the level of chlorine dioxide solution in the batch tank. When the level reaches the low level set point, it automatically opens the solenoid valve which allows water to flow into the system. A high efficiency eduction method mixes the three chemicals in a controlled sequence into the water. and rapidly produces chlorine dioxide solution.

When the batch tank reaches the high set point level, it automatically shuts off the water and stops production. Built-in overflow protection and other unique safety features make this a suitable generator for treatment of water systems up to 250,000 gallons per day of water use in a variety of applications.

3T Generator - Enclosure

3T Generator - No Enclosure

The 3T with no enclosure is built specifically for use in an enclosed area indoors. This makes it perfect for:

- Food Process
- Industrial Buildings
- Hospitals
- Beverage Manufactures and More

Ordering Information

APS-3T-A30	Simple automated generator control system. (no data recording system)
APS-3T-C30	Fully automated generator control system with built-in data recording

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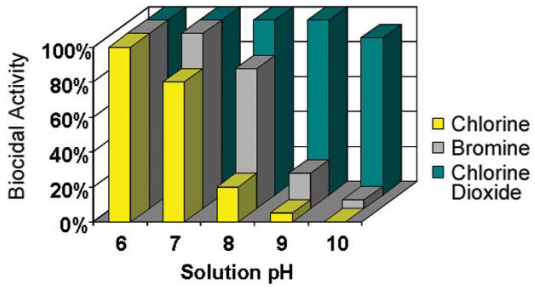
About Chlorine Dioxide

Chlorine Dioxide exists as a stable radical molecule in dilute solutions, and is 10x more soluble in water and 2.5x more efficient than chlorine treatments. Chlorine Dioxide is effective in a wide pH range from pH 4 to pH 10.

This powerful oxidizing biocide has been successfully used as a water treatment disinfectant for several decades is many countries, and is in use at over 1000 municipalities in the United States for drinking water treatment. Rapid progress has been made in the technology for generating Chlorine Dioxide, and knowledge of its reactivity has increased with improved analytical techniques. It absorbs light and breaks down into chlorite and chloride. Because of its oxidizing properties, chlorine dioxide reacts with iron, manganese and nitrates, but dose not react with ammonia. The oxidizing properties and the radical nature of chlorine dioxide makes it an excellent disinfectant against virus and bacteria, as well as many fungi and protozoa. In an alkaline media, the permeability of living cell walls to chlorine dioxide radicals seems to increase, allowing easier access to molecules. It is efficient against Giardia and has excellent biocidal activity against Cryptosporidia, which are resistant to chlorine and chloramines.



Biofilm

Unlike hydrogen peroxide and chlorine, chlorine dioxide was found to be an effective biocide for biofilms removal. Chlorine dioxide functions as highly selective oxidant due to its unique, one-electron transfer mechanism. Being a more selective oxidizer allows chlorine dioxide to have the capacity to penetrate the biofilms' matrix by targeting sulfide-containing amino acids or protein disulfide linkages. Those targeted reactions also explain why it is effective for biofilm control, even at very low dosage. Additionally, the presence of chlorine dioxide residual can also reduce viable microbes to become absorbed in the biofilm.

FAQs:

Can Chlorine Dioxide be used in combination with other disinfectants?

Answer: Yes

Chlorine Dioxide is often used in combination with chlorine in municipal drinking water plants in order to reduce the amount of trihalomethanes and HAAs that would be formed if chlorine was used alone. Chlorine Dioxide is added as the primary disinfectant in order to remove a number of oxidizable compounds without forming chlorinated by products. While chlorine is added after coagulation, settling and filtration at low levels in order to provide a residual biocide for use in the disinfection systems.

Recent research indicates that applying Chlorine Dioxide and chlorine within the same mixing zone can exhibit some synergistic effects (The combine effect being greater than the sum of the two parts).

What makes Chlorine Dioxide different from Chlorine?

Answer:

While Chlorine Dioxide has "chlorine" in its name, its chemistry is radically different from that of chlorine. As we all learned in high school chemistry, we can mix two compounds and create a third compound that bears little resemblance to its parents. We should not be misled by the fact that chlorine and Chlorine Dioxide share a word in common.

Chlorine Dioxide is generally more powerful, easier to use, and more environmentally friendly than equivalent chlorine treatments. Chlorine Dioxide is a more expensive treatment, but its superior environmental performance means that it is rapidly replacing chlorine in a number of applications.

Chlorine and Chlorine Dioxide are both oxidizing agents (electron receivers). However, chlorine has the capacity to take up two electrons, whereas Chlorine Dioxide can absorb five. This means that, mole for mole, ClO_2 is 2.5 times more effective than chlorine.

It is of greater importance that Chlorine Dioxide will not react with many organic compounds and, as a result, ClO_2 does not produce environmentally dangerous chlorinated organics. For example: aromatic compounds have carbon atoms arranged in rings and they may have other atoms, such as chlorine, attached to these rings to form a chlorinated aromatic – a highly toxic compound that persists in the environment long after it is produced.

Chlorine Dioxide's behavior as an oxidizing agent is quite dissimilar. Instead of combining with the aromatic rings, Chlorine Dioxide breaks the aromatic rings apart. In addition, as the use of Chlorine Dioxide increases, the generation of chlorinated organics falls dramatically.

How does Chlorine Dioxide react when it oxidizes?

Answer:

The predominant oxidation reaction mechanism for Chlorine Dioxide (and for ozone as well) proceeds through a process called free radical electrophilic (electron-attracting) abstraction, rather than by oxidative substitution or addition (as in chlorinating agents such as chlorine or hypochlorite).

It has this ability due to its unique one-electron exchange mechanism. One electron is transferred and Chlorine Dioxide is reduced to chlorite (ClO_2-).

The term "oxidation strength" is used to describe how strongly an oxidizer reacts with an oxidizable substance. Ozone is generally regarded as having the highest oxidation strength and reacts with every substance that can be oxidized. In practical terms, this is often undesirable since a number of side reactions can take place causing undesirable disinfection byproducts.

Chlorine Dioxide has lower oxidation strength than ozone, but is more powerful that chlorine. Less Chlorine Dioxide is normally required to obtain an active residual disinfectant. Unlike ozone, ClO2 can also be used when a large amount of organic matter is present.

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