Understanding Ozone

How Ozone is Made?

Advantages of Ozone.

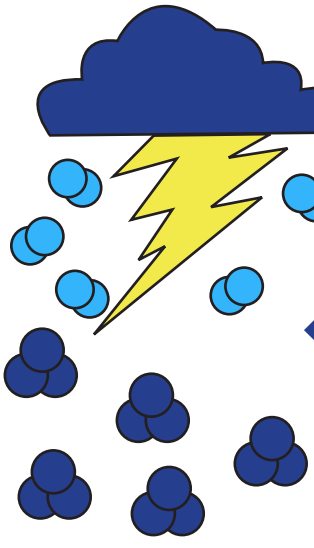
Ozone Effects on Bacteria, Viruses & Molds.

How is Ozone Made?

Did you know that ozone is made in nature?

It naturally does it in two ways.

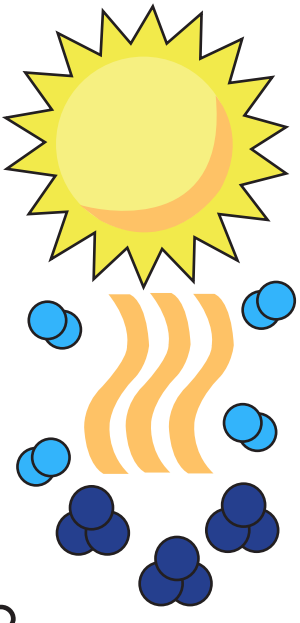
Lightning (corona discharge)



1. Lightning passing through the air creates ozone from oxygen.

2. Oxygen in the presence of 185 nm UV light creates ozone.

UV Light (sun)

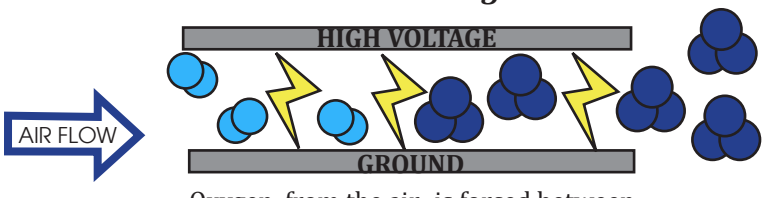


Both methods break-up oxygen molecules to form ozone.

How do we make ozone?

Same methods as above but on a much smaller scale.

Corona Discharge

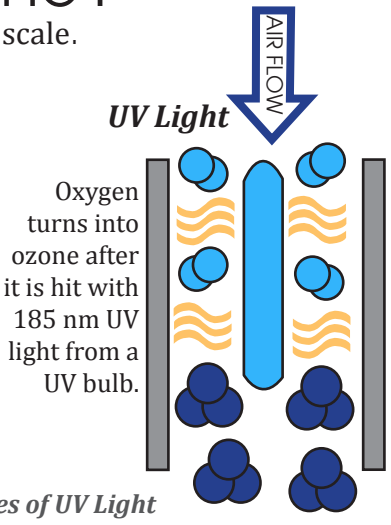


Oxygen, from the air, is forced between high voltage plates to simulate corona discharge. The oxygen is broken apart and recombines into ozone.

Advantages of Corona Discharge

- Generates high ozone concentrations
- Best for water applications
- Fast organic (odor) removal
- Consistent ozone output

UV Light



Advantages of UV Light

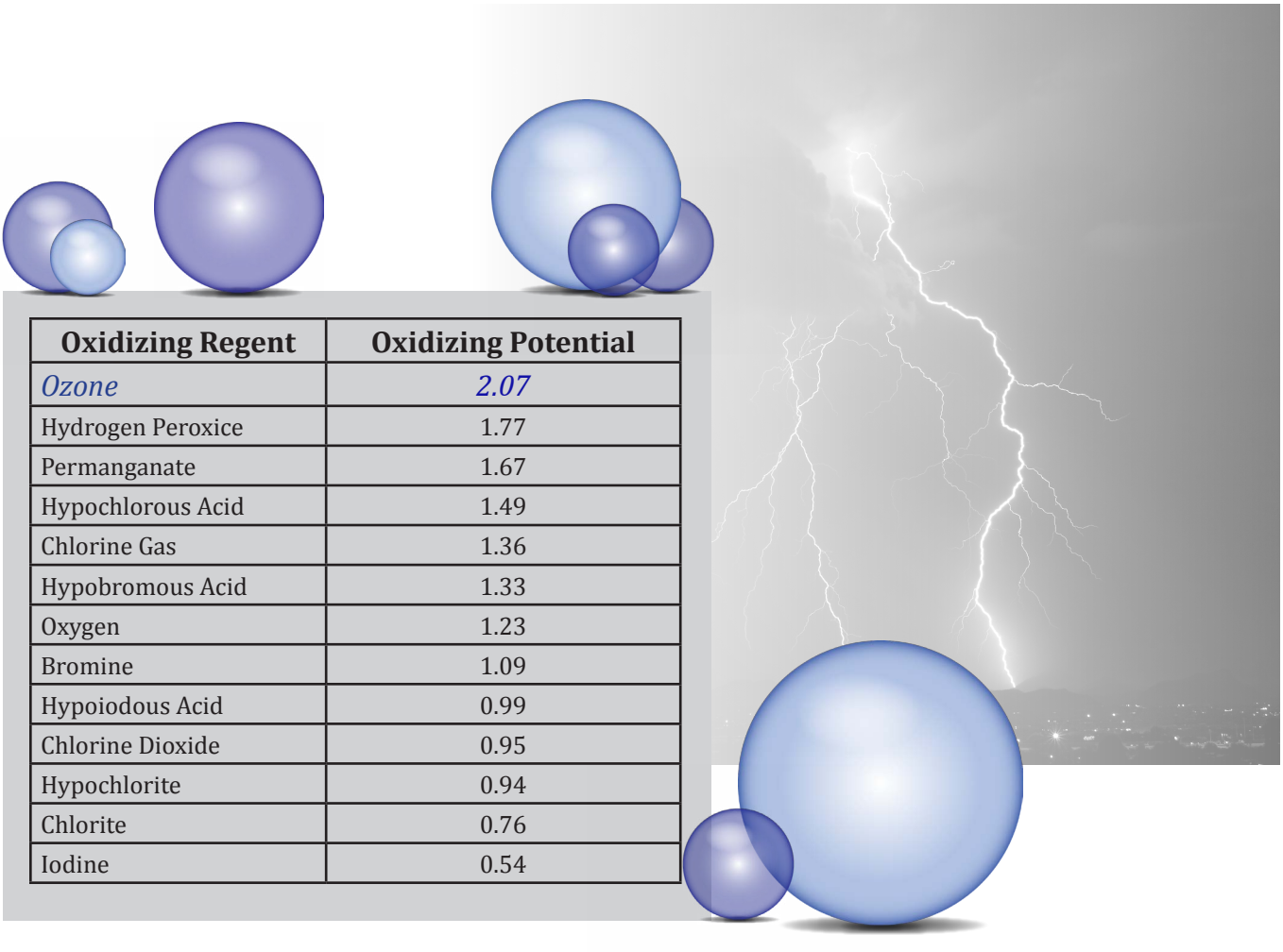
- Simple construction
- Lower cost than corona discharge
- Output less affected by humidity

Did you know that a single lighting strike can create over 300-lbs of ozone?

The first patent for an Ozone Generator was by Nikola Tesla in 1896.

Advantages of Ozone

- Ozone is the ***most powerful oxidant*** for disinfecting water or sanitizing surfaces
- Ozone can kill pathogens in seconds vs. several minutes for other oxidants
- Ozone is one of the strongest oxidant available for oxidizing organics
- Ozone decomposes into oxygen
- Ozone, by itself, does not affect pH
- Ozone cannot be stored; therefore, having a large volume of a dangerous oxidizer is not possible
- Ozone is excellent at oxidizing metals such as iron, manganese, and more
- Ozone enhances the flocculation and coagulation of organic material thereby improving filtration
- Ozone can be effective in partially oxidizing organics in the water to biodegradable compounds that can be removed by biological filtration



Oxidizing Regent	Oxidizing Potential
Ozone	*2.07*
Hydrogen Peroxice	1.77
Permanganate	1.67
Hypochlorous Acid	1.49
Chlorine Gas	1.36
Hypobromous Acid	1.33
Oxygen	1.23
Bromine	1.09
Hypoiodous Acid	0.99
Chlorine Dioxide	0.95
Hypochlorite	0.94
Chlorite	0.76
Iodine	0.54

Source: water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/upload/2001_01_12_mdbp_alter_chapt_3.pdf

In the summer of 1993 a cryptosporidium outbreak in Milwaukee, WI resulted in the largest waterborne disease outbreak in documented United States history. An estimated 400,000+ were ill with over 100 deaths were attributed to this outbreak. Chlorine, the primary disinfection technology, was useless against this cyst. A 55 million dollar ozone system was installed and effectively killed this organism. Milwaukee has not had an outbreak since!

Ozone Effects on Bacteria, Viruses, & Molds

Ozone interferes with the metabolism of bacterium-cells, most likely through inhibiting and blocking the operation of the enzymatic control system. A sufficient amount of ozone breaks through the cell membrane, and this leads to the destruction of the bacteria.

The effect of ozone below a certain concentration value is small or zero. Above this level all pathogens are eventually destroyed. This effect is called all-or-none response and the critical level the "threshold value"

Bacteria:
Virus:
Mold:

Pathogen	*Dosage*
Aspergillus Niger (Black Mount)	Destroyed by 1.5 to 2 mg/I
Bacillus Bacteria	Destroyed by 0.2 m/I within 30 seconds
Bacillus Anthracis	Ozone susceptible
Bacillus Cereus	99% destruction after 5-min at 0.12 mg/l in water
B. Cereus (Spores)	
Bacillus Subtilis	
Bacteriophage F2	
Botrytis Cinerea	
Candida Bacteria	
Clavibacter Michiganense	
Cladosporium	
Clostridium Bacteria	
Clostridium Botulinum (Spores)	
Coxsackie Virus A9	
Coxsackie Virus B5	
Diphtheria Pathogen	
Eberth Bacillus (Typhus Abdomanalis)	
Echo Virus 29: The virus most sensitive to ozone.	
Enteric Virus	
Escherichia Coli Bacteria (from feces)	
E-coli (in clean water)	
Encephalomyocarditis Virus	
Endamoebic Cysts Bacteria	
Enterovirus Virus	
Fusarium Oxysporium S Sp. Lycopersici	
Fusarium Oxysporium F Sp. Melonogea	
GDVII Virus	
Hepatitus A Virus	
Herpes Virus	
Influenza Virus	
Klebs-Loffler Bacillus	
Legionella Pneumophila	
Luminescent Basidiomycetes	
Mucor Piriformis	
Mycobacterium Avium	
Mycobacterium Foruitum	
Penicillium Bacteria	
Phytophthora Parasitica	
Poliomyelitis Virus	
Poli ovirus Type 1	
Proteus Bacteria	
Pseudomonas Bacteria	
Rhabdovirus Virus	
Salmonella Bacteria	
Salmonella Typhimurium	
Schistosoma Bacteria	
Staph Epidermidis	
Staphylococci	
Stomatitis Virus	
Streptococcus Bacteria	
Verticillium Dahliae	
Vesicular Virus	
Virbrio Cholera Bacteria	
Vicia Faba Progeny	

The list on the left are pathogens that can be destroyed and are susceptible to Ozone. Please contact us or visit our show room to know more about dosages and other technical details.

www.pure-o3.com
info@pure-o3.com

Did you know that, to date, there has not been a single bacterium, virus or cyst discovered that can withstand ozone? Ozone kills them all!