



What is Ozone?

- 🔥 Oxygen in the air (O₂) is composed of two oxygen molecules. Under certain conditions, three oxygen atoms can be bound together instead, forming ozone (O₃). It is also referred to as activated or enriched oxygen.
- 🔥 Ozone occurs naturally in the earth's atmosphere and protects us from the sun's harmful rays. Thousands of tons of ozone are produced daily during thunderstorms or around high-tension lines.
- 🔥 Ozone is applied commercially as a disinfectant instead of chlorine and other disinfectants. It is used in air and water purification. It destroys algae, bacteria, molds and mildews, eliminates spores, yeast and fungus and inactivates viruses and cysts.

How does Ozone disinfect water?

By oxidation of specific cell wall components, the ozone disinfects water and kills bacteria. However, ozone is non specific and it will oxidise many different types of chemicals, both organic and inorganic, e.g. manganese, iron, or minerals, proteins or other organics. The presence of these components will reduce the concentration of ozone in the water and therefore, the germicidal properties of the gas.

What are the advantages and disadvantages of ozone treatment?

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Advantages:

- 🔥 It does not leave any residual, harmful chemical in the water
- 🔥 Ozonation does not produce any taste or odour in the water
- 🔥 Ozone is absolutely environmentally friendly
- 🔥 It kills all pathogenic organisms by a direct effect on their DNA
- 🔥 Disinfection occurs 30,000 times faster than with chlorine, so a prolonged contact time is unnecessary.
- 🔥 As ozone is an unstable gas, it has to be produced on site, thus no gas or chemical storage facilities are necessary.

• There is no regrowth of microorganisms after ozonation, unlike ultraviolet and chlorine disinfection.
• Ozone is generated onsite, and thus, there are fewer safety problems associated with shipping and handling.
• Ozone decomposes rapidly, and therefore, it leaves no harmful residual that would need to be removed after treatment.
ETI (Environmental Technology Initiative). Project funded by the U.S. Environmental Protection Agency under Assistance Agreement No. CX824652

Disadvantages:

- 💧 Ozone is a very powerful oxidant
- 💧 The initial set-up is costly
- 💧 High electricity consumption.
- 💧 Unlike chlorine and iodine, ozone does not protect the water after application.

- Ozonation is more complex than other disinfection technologies.
- Ozone is very reactive and corrosive, thus requiring corrosion-resistant material, such as stainless steel.
- Ozone is extremely irritating and possibly toxic, so off-gases from the contactor must be destroyed to prevent worker exposure.
- The cost of treatment is relatively high, being both capital- and power-intensive.
- There is no measurable residual to indicate the efficacy of ozone disinfection.

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References:

Canada Health (2005) Water Treatment Devices for disinfection of drinking water.

WISA (2002) Handbook for the operation of wastewater treatment works Ed. Philip Pybus