



Almost everything you need to know about

OZONE

treatment of

ROOF WATER

OzonZ
PO Box 302-097, North Harbour
New Zealand
Tel: +649.415 3335, Fax: +649.415 3336
www.ozonz.com

Facts about roof-collected water

Traditionally viewed as a safe reliable source of domestic water, rainwater can be exposed to many pollutants. A number of national studies have shown that the microbiological quality of roof collected water is usually poor. The latest Ministry of Health published data shows that less than 90% of the water tanks tested in New Zealand failed to meet national drinking water standards (DWSNZ:2000).

Overseas investigations also revealed that rainwater in many instances does not meet World Health Organisation (WHO) or Environmental Protection Agency (EPA) bacteriological standards.

The pathogens found include E. Coli, Salmonella, Cryptosporidium, Giardia and Campylobacter, all potentially causing gastrointestinal illness. The likely sources of these pathogens are faecal deposits from birds, possums, rodents, and dead animals and insects.

People most at risk are children, elderly people, sickly people and visitors.

The main areas which need attention are lack of regular maintenance, poorly designed delivery systems and storage tanks, inadequate disinfection of the water and failure to adopt physical measures to prevent the water against microbiological contamination.

Fortunately, all of the contaminants that infect roof water can be successfully treated with ozone and water kept fresh and tasty all year around.

What is ozone?

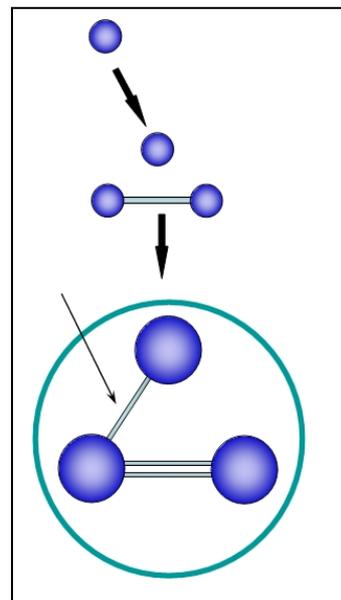
Ozone was first identified in 1785 and is derived from the Greek work "Ozein" meaning smell. It was first used for water disinfection of drinking water in Nice, France, in 1907. Ozone is currently used in more than 3,000 water plants world wide.

The heart of the system is the Corona Discharge cell which uses a small amount of electricity to convert the free oxygen in the air into ozone gas.

These oxygen molecules are broken into atoms by the corona discharge in the cell. Single oxygen atoms cannot exist alone without regrouping back to di-atomic oxygen molecules.

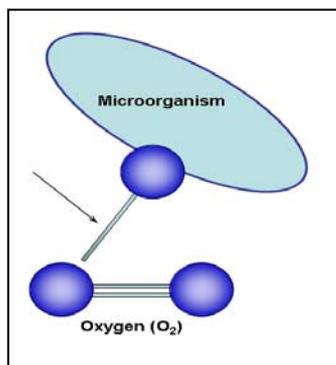
During this recombination stage some atoms will regroup into loosely bonded tri-atomic oxygen. This new molecule is called ozone.

The weak bond holding ozone's third oxygen atom is what causes ozone to be a very strong oxidant and an ideal chemical-free purification and a disinfecting agent.



Ozone is frequently misdiagnosed and equated to low altitude pollution. Nothing could be farther from the truth. In fact ozone breaks down pollutants and should be welcomed if found in the air.

Ozone destroys micro-organisms rapidly and naturally



Ozone is a natural gas, a tri-atomic form of oxygen. Being much more effective than chlorine, ozone can do everything that chlorine can do and more.

When ozone comes into contact with a micro-organism (bacteria, virus, cysts, etc.), the weakly bonded oxygen atom ruptures the cell wall, causing osmotic bursting and cell death.

This contrasts with other methods which merely prevent micro-organisms from multiplying.

The ozone continues to oxidise enzymes and DNA as shown in the electron microscope pictures. The weak bond splits leaving environmentally friendly oxygen as a by-product.

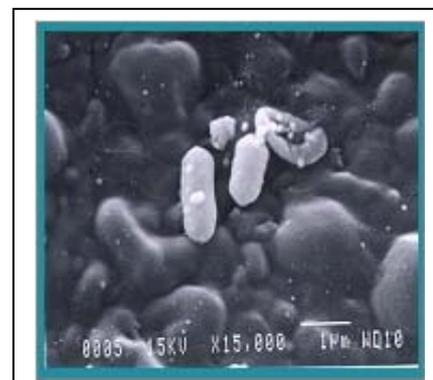
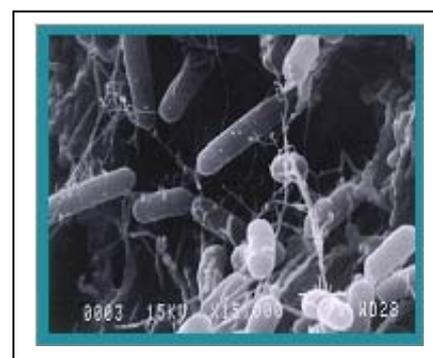
An ozone level of 0.4 ppm for 4 minutes has been shown to kill any bacteria, virus mould and fungus. Ozone will inactivate viruses on contact.

In case of polio, only 0.012 ppm removes all viral cells in less than 10 seconds. Giardia and Cryptosporidium cysts are susceptible to ozone but not affected by normal levels of chlorine.

Table 1 compares the lethality coefficients of ozone and chlorine. As an example, at the same concentration level, ozone destroys enteric bacteria 2,500 times faster than OCL.

This natural gas is a much more powerful disinfectant than traditional oxidants like chlorine with no harmful by-products. Micro-organisms do not build up a tolerance to ozone.

Ozone is world wide approved as an antimicrobial in the treatment, storage, and processing of bottled water and foods.



Ozone removes odours

Contamination from decomposing bird or animal, decaying organic matter and smoke from the fire place often leads to unpleasant tastes and odours. Long periods of high temperature with little rain can produce water that even the 'long time' tank water drinker will find unpleasant.

Unlike other systems, which merely 'inactivate' micro-organisms, ozone rapidly 'burns up' organic molecules, which are the prime source of smelly water, before reverting back to oxygen without leaving any harmful chemical residuals.

This high level of dissolved oxygen in your tank water improves the taste and freshness of your water.

Ozone versus chlorine

Chlorine has been the workhorse of water disinfection for over 100 years.

Chlorine reacts with organic materials to form organics containing Chlorine such as Chloroform, Carbon Tetrachloride, Chloromethane and others generally known as Trihalomethanes (THM's).

These THM's have been implicated as carcinogens in the development of kidney, bladder and colon cancer.

When comparing disinfection efficiency, ozone is 25x more effective than Hypochlorous acid (HOCL), 2500x better than Hypochlorite (OCL) and 5000x more than Chloramine (NH₂CL)

Disinfectant	Bacteria	Viruses	Spores	Cysts
Ozone	500	5	2	0.5
Chlorine as HOCL	20	1	0.05	0.05
Chlorine as OCL	0.2	0.02	0.0005	0.005
Chlorine as NHCL	0.1	0.005	0.001	0.02

Table-1: Lethality coefficients

Healthy and chemical free

Ozone produces no harmful by-products. Unused ozone slowly decomposes to normal oxygen and raises the level of dissolved oxygen in the water. This makes the water healthy, and tasty.

Ozone generally occurs in natural settings at around 0.02 ppm, but it can be as concentrated as 0.1 ppm. At this level it is capable of keeping pathogens in check and yet is not harmful to higher life forms such as animals or man.

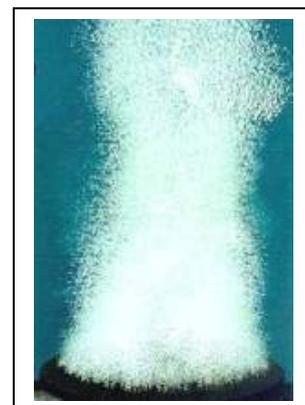
Ozone is not a detrimental influence in nature. Only a prolonged exposure to highly unnatural levels of ozone may lead to discomfort, later headache and coughing, warning you to leave the space and seek better air. Unlike chlorine, no-one has died from exposure to ozone yet!

How does it work?

The OzonZ™ tank ozonators deliver the ozone under pressure into the water. A powerful air-pump delivers the ozone through a hose to a submerged ceramic diffuser.

This system creates millions of very fine ozone-rich bubbles. As the bubbles rise up through the water the ozone is absorbed in the water and cause large quantities of water to circulate through the tank.

Ozone dissolves about 12 times more easily in water than pure oxygen. It rapidly disinfects and oxidises contaminants before reverting back to oxygen without leaving any harmful chemical residues.



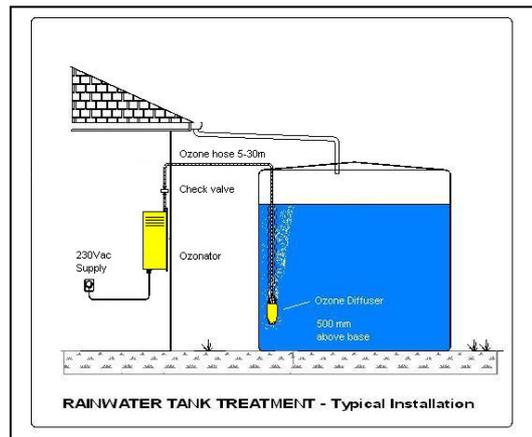
This process also boosts the oxygen level in your water making your roof water fresh, healthy and safe to drink.

Easy Installation:

The OzonZ™ tank ozonators are 'plug and play' systems that require no plumbing and can be installed D.I.Y by the owner with little effort.

The ozonator is secured with two screws on the wall near a power outlet. Lower the diffuser into the tank and connect to the ozonator with the hose supplied.

A 5 meter ozone delivery hose comes with the kit however you can install the ozonator up to 30 meter from the tank with little loss of performance.



Low operating costs

The system uses as little electricity as the cost of running a household light bulb, about 20 cents per day. You don't need to regularly buy any chemicals or expensive UV lamps. The ozone producing cell has a life expectancy of 5 years.

Obtaining the best results from your tank ozonator

Your ozonator will give best performance if some simple precautions are taken. Maintenance and design are vital to good health. In general the ozonator will comfortably cope with most water conditions.

However, when an ozonator is to be installed in a water tank system of unknown bacteriological content, it is advisable to start with a clean 'slate' as the ozonator is designed to maintain the water in a clean slate, **not** to clean up a badly contaminated situation.

Contamination from roof run-off can accumulate as sludge in the tank floor, and unlike surface water, does not get "flushed away".

Here are some important steps which can improve the safety of the water you are collecting:

- Ensure the roof surface area is suitable for collecting portable water. Keep roof catchments clean and clear of moss, lichen, debris and leaves. Cut back all trees and branches that overhang your roof. A clean impervious roof made from non-toxic material is recommended. Avoid lead flashings or lead based paint.



- Reduce all the possible sources of contamination in the water inflow as well as in the tank. Install Screens, Strainers, Leaf Guards, First (Foul) Flush Diverters etc.
- Regular maintenance and inspections and cleaning gutters, tank inlet screens
- Tank taps or draw-off pipes at least 100mm above the tank floor, or a floating arm draw-off valve.
- A tank floor sloping towards the sump and washout pipe.
- A well covered manhole for easy access and inspection.
- Have the tank, down pipes & gutters cleaned out thoroughly, and if necessary, flush through the pipes to the house with a suitable sanitiser, such as hydrogen peroxide. (*Rinse well before drinking. See note below.*) To assist in cleaning the tank, install a tank vacuum kit to suck water from the bottom of the tank (the dirty zone) when the tank is full to overflowing

Note: “Shock dosing” your water tank with special chemicals will help to disinfect and deodorize the tank and piping. However if the source of contamination is not removed this may only be a temporary measure.

- Set the Ozonator up to run continuously for the first week. During that time a steady improvement in the taste and the clarity of the water will become apparent. After that period, the running time can be reduced to suit the water conditions and the water usage.
- Suspended matter in the water can be removed with an in-line filter if desired. Consult you dealer for information.

Frequently asked questions:

How does the unit compare with a UV (germicidal) sterilizer?

The UV sterilizer works differently. It has no oxidizing power, therefore it cannot change the taste of the water. The steriliser merely inactivates the reproductive cells, while the ozone literally destroys the cell.

Can the unit change the taste of my water?

Usually tastes and odours in drinking water result from the decomposition of humic and organic materials.

Ozone is very effective in making drinking water free of tastes and odours because it quickly oxidises (burns-up) most organic materials.

Is the ozonator easy to install?

It's so simple, you can do it yourself. If you follow the step by step procedure in the manual provided, you will see that you need to attach the ozonator with 2 screws to the wall, connect the hose to the diffuser and plug in the power.

How far can the ozonator be removed from the water tank?

You can install the ozonator up to 30 meter from the tank without any significant degrading of performance. This is useful in case the tank is removed from the house.

Can I use the ozonator on bore water?

Bore water frequently contains dissolved iron and manganese as well as hydrogen sulfide. Ozone will effectively bring these

contaminants out of solution (oxidise) but to remove them you will need to install additional filtration.

What does it cost to run the ozonator?

For one thing you don't need to regularly buy any chemicals. But it does need a little electricity to produce the ozone from free air at the equivalent cost of running a light bulb

What maintenance is required?

The special ozone producing cell has a life expectancy of 5 years and 10 years if operated 10 hours per day. The ozone diffuser may require regular cleaning by washing it in a diluted solution of pool acid.

What after sales service is available?

Any application and technical questions can be addressed via our website. Repairs are typically done on a 24 hr turn-around basis.

What guarantee do we offer?

The ozonators are guaranteed for one year parts and labour on a "back-to-factory" basis provided the unit is operated according the operating and maintenance manual. Refer to our standard conditions of sale for details.

Should the tank be cleaned before installing the ozonator?

Yes, getting the basics right such as regular maintenance of your water tank

and prevention of any contaminants getting flushed in the tank are most important. It will make the ozonator work more effectively for you and produce better results.

How much water will the ozonator treat?

The normal domestic consumption from a 5,000 Gallon tank is about 1,000 litres per day. The TD-500 will cope with this comfortably unless abnormally high levels of contamination are present. If you feel you need a bit more grunt use the TD-1000 which produces double the amount of ozone.

How long do I run the unit?

When first installed, or after a period of heavy rain, run the ozonator continuously until the water is up to the condition you require. After that running time may be reduced to 10-12 hours depending on the circumstances.

How long will it take to clean up the water?

Depending on the water condition, it may take several days. A distinct improvement in taste should be noticed after 2-3 days.

Can I over-treat the water with ozone?

No, you cannot over ozonate water. Excess ozone will simply revert back to oxygen and make the water healthier and taste better.

ACKNOWLEDGEMENTS

This White Paper has been copied, pasted and collated from a large number of industry and internet sources and therefore no originality can be claimed. OzonZ believes its content is accurate and relevant to promote better understanding of the technical aspects of ozone and its application in roof water treatment. Use it at your own risk. With special acknowledgements to Del Ozone, Azco Industries, Novozone, Marley, New Zealand Ministry of Health publication 4602, Massey University Roof Water Research Centre and others.

OzonZ is a Registered Trademark of Novozone Limited (New Zealand)