

BUILDING INFRASTRUCTURE WATER MANAGEMENT

GROUNDWATER, STORMWATER, RAINWATER, DRINKING WATER & RE-USE WATER



Ozone is a sustainable and environmentally safe water treatment that is chemical-free, energy-efficient and cost-effective. Ozone provides an ideal water treatment solution for a broad scope of complex water management issues. Ozone has been used for more than 100 years and is now the fastest growing technology in the global water disinfection market.



OZONE ADVANTAGES

The demand for eco-friendly, sustainable solutions for building water management is rapidly expanding due to water shortages and increasingly more stringent municipal water discharge and non-potable re-use water regulations.

Aclarus Ozone systems are designed and engineered to provide a cost effective solution for a range of complex water treatment challenges. Aclarus systems can be built on a relatively small footprint, and easily retrofitted typically within existing infrastructure.



Aclarus Ozone provides solutions for the following operational challenges:

- Groundwater
- Stormwater
- Rainwater
- Re-Use
- Green Roof Run-off
- Drinking Water

Ozone system installations are rapidly growing in building infrastructure applications due to the following advantages over traditional water treatment methods:

- Fully automated; minimal operator training or maintenance requirements;
- Environmentally friendly; the only residual is dissolved oxygen;
- Oxidizes, disinfects and clarifies without chemicals;
- Treats incoming water to meet or exceed bottled-water standards;
- Neutralizes unhealthy metals and organics including iron, sulphur and manganese;
- Removes any colour, taste or odour;
- Removes contaminants of emerging concern (CEC's), such as pesticides, PFAS, petrochemicals, pharmaceuticals and micro-plastics;
- Ozone is approved by the US FDA, and in Canada by the CFIA.
- Produced onsite, removing the need to purchase, transport, store and physically handle chemicals;
- Lowest Lifetime Operation Cost (LOC); and,
- Quick Return on Investment (ROI).



ACLARUS SOLUTIONS

GROUNDWATER, STORMWATER, RAINWATER & RE-USE WATER

With growing concern about water shortages, governments are introducing more regulations that require industry and buildings to re-use water for non-potable use. However, ground, storm and rainwater can be affected by surface influences and therefore require treatment before being discharged into waterways – a process that can strain treatment plants.

Re-using water has significant environmental, economic and social benefits:

- **Less storm water for the municipality to treat and discharge;**
- **Less demand from municipalities for potable water treatment used in non-potable sources (e.g. toilets), which leads to lower GHG emissions (from treatment); and,**
- **Lower costs for building and business owners (lower fees for incoming water and discharge, and no ongoing chemical purchase, storage costs or safety issues)**

However, there are challenges in achieving these benefits. Few treatment solutions exist that match the ability of ozone to oxidize, disinfect and remove colour, odour, metals, organic/inorganic matter, and other contaminants without the use of chemicals; manage high flow rates; deal with varying water quality; and, are fully automated and low-maintenance.

With an increase in demand for sustainable solutions to solve re-use and building water management issues, ozone is increasingly being employed because of its numerous advantages over traditional treatment methods. Supplementing or replacing an existing system with an ozone system has the potential to reduce costs and lessen environmental impacts.

GREEN ROOF

Green roof treatment for re-use is becoming more commonplace for its sustainable approach and the benefits to users and the public.

Green Roof refers to buildings that have vegetation, gardening and infrastructure to collect water not used by plants and vegetation. As this water is often influenced by soil and roof material, it requires specialized treatment.

Ozone offers complete disinfection, oxidation of metals, and removal of organics as well as colour and odour of the water. This provides water that meets end-user expectations for quality as well as marketing opportunities for ESG and responsive environmental policies. Cost savings for the building and reduced stress on municipal infrastructure and the environment provide a compelling case for ozone in re-use applications.



ACLARUS SOLUTIONS

DRINKING WATER

Treating incoming water through an ozone system can provide competitive advantages for property owners.

Ozone solves multiple treatment issues safely and efficiently. It works on demand to very quickly disinfect and treat water without chemicals, and the treated water is of premium quality, with no chemical residual or by-products.

Regardless of the source of the water, ozone and post-filtration will remove bacteria, chlorine and other chemicals, metals, and even many micro-pollutants such as hormones, pharmaceuticals, microplastics and petrochemicals from municipal water. It also removes colour, taste and odour from the water, an important benefit for condominiums.

Ozone has no impact on pH levels in the water and leaves no residual, as it breaks down to oxygen before use.

Aclarus Ozone systems are NSF-61 Certified. NSF-61 is a certification given by NSF International, an independent public health and safety organization that sets stringent health and safety standards for products available to consumers around the world.



Certified to
NSF/ANSI/CAN 61
& NSF/ANSI 372



To receive this certification, Aclarus Ozone Systems must meet or exceed strict standards that ensure that the chemicals and materials used in the production of drinking water are safe. It certifies that all components in the production process have been thoroughly tested to industry standards and will not add contaminants that could pose health risks.

Achieving NSF-61 certification requires a multi-step process that includes performance testing and a comprehensive product literature review. Once a product is certified, end users and regulators have confidence that the product has met the requirements of this rigorous industry standard.

Much of the U.S., as well as countries around the world – including Canada – rely on this certification standard. NSF-61 certification is often mandatory for equipment used in water-treatment facilities.



ACLARUS SYSTEMS OVERVIEW

Aclarus Ozone systems generate ozone on-site, with an ozone level calibrated for each application and flow rate. The systems are scalable and offer advanced ozone generation, mixing and control systems for reliable and accurate treatment. They can range from simple on/off systems to fully programmable control systems with remote monitoring, alarm integration, ozone dose control and more.

Aclarus' advanced saturation systems maximize ozone transfer into water at an average of over 90% compared with traditional transfer rates of approximately 10%. Using inline monitors, the water is measured for automated control to either increase or decrease the ozone level to remain at a set point for optimal function.

Aclarus Ozone systems also remove excess ozone from the water after treatment, limiting potential off-gassing by using integrated air monitors for safe workspaces.

Following ozonation, the water is filtered and then ozone is either removed for incoming use or retained used for CIP sanitation. Aclarus system controls are IOT enabled and allow for remote monitoring.



SAFETY

Buildings need safe and reliable systems that are practical and easy to use.

Ozone is generated on-site at the time of use. This eliminates the need for bulk chemical handling and storage, as is the case for chlorine. In the event of an ozone leak, a sensor will shut down the system, activate a flashing red warning light, and turn on an exhaust fan. The flashing red light will deactivate once ambient conditions are safe for entry. Even without the ventilation fan, the ozone would break down spontaneously within minutes of its release.

A chlorine leak, on the other hand, requires operators take extreme safety precautions prior to entering the room. They must wear protective suits to prevent skin contact and use self-contained breathing apparatus (SCBA) to

prevent inhalation. Ventilation of chlorine to the outside, without prior neutralization, presents a safety concern for bystanders.

Studies have also shown that chlorine can react with organic components in wastewater effluent to form carcinogens such as trihalomethane (THMs).

Ozone does not react with organic components; rather, it breaks down into organic compounds. And, when sulphur dioxide is added to neutralize chlorine, it reduces the amount of dissolved oxygen in the water, and increases the water's acidity because hydrogen chloride and sulfuric acid are produced. Ozone treatment eliminates many of the potential safety hazards associated with chemicals.



ACLARUS SYSTEMS

COST COMPARISON

There is a common perception that ozone is an unaffordable approach to water treatment. In fact, the average operational cost of the Aclarus Ozone System is approximately 5-10 cents per 1,000 litres of treated water, offering the lowest Lifetime Operating Cost (LOC) compared to other technology and a quick Return on Investment.

Aclarus Ozone systems are found in a wide range of applications – including municipal operations – precisely because they are a cost-effective and reliable treatment. There is significant independent research demonstrating the savings for municipalities when switching to ozone.

The savings are found in four categories:

- **Less Monitoring of Equipment:** Unlike the conventional chlorination systems, the Aclarus Ozone System requires very little operator intervention. A local programmable logic controller (PLC) continuously monitors oxidation readings and adjusts the ozone generator to maintain the pre-determined setting. If the oxidation goes out of range, equipment fails, or an ozone leak occurs, an automated alarm system alerts the operator. A single Accuvac Ozone Test is performed once per day to confirm that the oxidation-reduction potential (ORP) is reading accurately.
- **Lower Peripheral Costs:** Producing ozone requires more electricity than running a chlorination system. However, ozone does not have the same peripheral costs as chlorine, including the purchase of the chemical and the costs associated with its safe handling and storage. UV systems can be more costly than ozone because they require a UV chamber that increases an organization's CAPEX costs, use more electricity, and require the regular replacement of bulbs.
- **Easier Regulatory Compliance:** Due to government regulations on chlorine discharges into waterways, significant operator time is spent monitoring and controlling the chlorine and sulphur dioxide feeds. Incomplete disinfection is a regulatory violation, and the operator time required to ensure compliance with regulatory bodies is significant. Conversely, ozone control is completely automated, and since the ozone rapidly degrades to oxygen, it is unnecessary to remove the ozone post-disinfection. Operator time to control the ozone is therefore minimal.
- **Reduced Maintenance:** Chlorine is extremely corrosive and damaging to nearly every component with which it comes into contact. The chlorine transfer lines and regulators must be cleaned/replaced annually. The ozone system uses 316 stainless steel for all its transfer lines, so maintenance cost is negligible. UV systems, meanwhile, require regular monitoring of UV bulbs and their periodic replacement. The bulbs also end up in landfill.





ABOUT ACLARUS OZONE

Aclarus Ozone is a leading North American ozone solutions provider, with more than 1,000 global installations including commercial, industrial, municipal and First Nations. Ozone is a superior chemical-free disinfectant, energy efficient, cost effective, sustainable and environmentally safe.

Aclarus provides superior oxidation, disinfection and clarification solutions for drinking water, wastewater, groundwater, stormwater, rainwater, reuse, process water and CIP sanitation. Every Aclarus solution is designed and engineered to unique requirements and is backed by robust research, rigorous testing, service and support.

To learn how Aclarus can solve your most complex water treatment challenges please visit our website www.AclarusOzone.com, and click Ask Adam or call 1-888-705-8801

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**ASK
Adam**



INSTALLATION EXAMPLE

AOWT-60, GROUNDWATER TREATMENT SYSTEM

Bayside, Toronto ON

PURPOSE

Client's new construction was located in the southern end of eastern Toronto along the lakeshore. The groundwater was heavily contaminated and required treatment to remove high levels of sediment, dissolved metals, biological and other contaminants on a continual basis.

RESULTS

This system was designed to provide on-going, automated treatment for poor water quality in a facility without dedicated service or maintenance people. The treatment ability led to the client using additional systems for the neighboring building and other properties within the Toronto area.

Main System Specifics	Monitoring Equipment	Param.	Results mg/L	
			Raw	Treated
140g/hr Ozone Generator	PLC/HMI, Remote Connect	P	0.056	0.171
60 GPM Flow Rate	Ambient Ozone Monitor	Fe	45.0	0.056
20LPM of ~95% oxygen	In-line ORP	Mn	0.217	0.0148
Injection System, Tank x 2	Degas System	Cr	0.00084	0.00014
Back-Wash Filtration	Automatic dose control	Ni	0.0021	0.0012
Off-Gas Destruct		Zn	0.130	0.029
		As	0.0015	0.00002



AO-320, GROUNDWATER TREATMENT SYSTEM

Toronto ON

PURPOSE

Another project in Toronto with high flows needing treatment for primarily metals, and solids.

RESULTS

This system has exceeded expectations with manganese levels as low as 10ug/L.

Main System Specifics	Monitoring Equipment	Param.	Results mg/L	
			Raw	Treated
320g/hr Ozone Generator	PLC/HMI	Mn	0.062	0.010
150 GPM Flow Rate	Ambient Ozone Monitor	Fe	2.32	0.256
50LPM of ~95% oxygen	In-line ORP	As	0.0010	0.0003
Injection System, Tank x 2	Degas System	Zn	0.011	0.002
Back-Wash Filtration	pH Control if needed	TSS	6	< 2
Off-Gas Destruct	Automatic dose control	BOD	7	6



AOWT-120, GROUNDWATER TREATMENT SYSTEM

Niagara Region, Toronto ON

PURPOSE

This pilot project demonstrated effective treatment of landfill leachate.

RESULTS

High levels of iron, manganese, and zinc were effectively removed. Lower levels could be achieved but not required under applicable regulations for this location.

Main System Specifics	Monitoring Equipment	Param.	Results mg/L	
			Raw	Treated
120g/hr Ozone Generator	PLC/HMI	Mn	1.85	0.090
15 GPM Flow Rate	Ambient Ozone Monitor	Fe	19.2	0.031
20LPM of ~95% oxygen	In-line ORP	P	0.40	<0.03
Injection System, Tank x 2	Degas System	Zn	0.050	0.022
Off-Gas Destruct				

