Primozone®

REDEFINING
OZONE TECHNOLOGY

OZONE AS IT SHOULD BE

A successful ozone water treatment installation depends on its ability to **SECURE THE REQUIRED LEVEL** of dissolved ozone in the water at all times.

How this is done can be more or less energy-consuming, safe and costly. And that's where Primozone can **CHANGE THE WAY** you look at and design an ozone solution.

This guide is an introduction to the Primozone technology, how it works and all the concrete ways it benefits you. It will provide you with a better understanding of what makes Primozone such a game-changer, and offers a structured way to explain the technology and its advantages.

- **Highest ozone concentration available**
- **Redundancy built in**
- **Up to 50% less total energy use**
- **Lower operating and maintenance costs**
- **Safe, quiet, reliable**

Q: Why does high ozone concentration matter?

A: High concentrations of ozone in the gas mixture creates efficiencies system wide: less energy is used because you can use smaller oxygen generators, smaller pumps and dissolution systems and smaller ozone destruct units. This also, of course, affects the investment cost. Dissolution is improved because less gas needs to be dissolved thanks to the high concentration of ozone in the gas – doubling the concentration doubles the dissolution ability of the ozone in the liquid.

YOU'VE NEVER SEEN AN OZONE REACTOR QUITE LIKE THIS

DON'T LET THE SIZE FOOL YOU

The patented Primozone anodized aluminium reactor uses an improved version of the cold plasma ozone generation method (or dielectric barrier discharge method) to produce ozone.

Its compact size means oxygen doesn't have to travel as far as in a conventional glass tube technology reactors, enabling more efficient conversion of gas. The reactor's compactness also means naturally higher gas output pressures, key to the Primozone generator's remarkable ozone concentrations and subsequent dissolution in water.

COOL TO THE CORE

Another unique feature of Primozone ozone generators – the electrical power units and reactors are fully integrated in the water cooling system and cooled internally (in the generator) This means there is no need for a closed air-conditioned space for the generator, allowing a smaller system footprint and lowering energy use. The efficiency of temperature control also improves ozone production, as high temperatures have a negative impact on ozone formation.

MODULAR MEANS OPTIONS

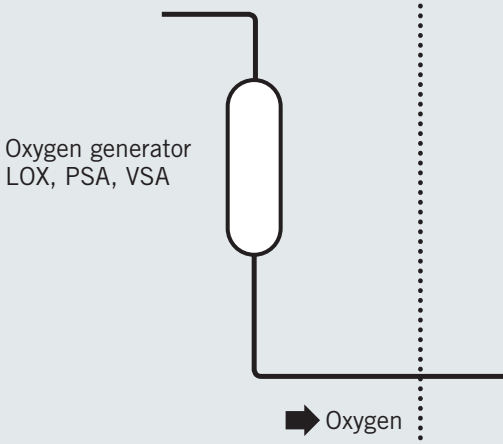
Primozone ozone generators are much smaller than traditional alternatives, and designed to work as a modular system to meet required capacities. That means a smaller footprint, as you can install the capacity you need without oversizing. It makes retrofitting simpler, as Primozone generators will easily fit in the space a larger traditional generator once occupied. There's no need to disrupt production during service, as linked generators continue ozone production even when one is offline. And as your needs change, you can simply add new modules – Primozone ozone solutions can grow as quickly as your capacity needs grow.

A "NO NEED TO CLEAN" PROMISE YOU CAN KEEP

A Primozone ozone reactor needs no cleaning – its robust all-aluminum design and the high gas pressure ensure that no contaminants will stick to its surface, thus securing maximum up-time.

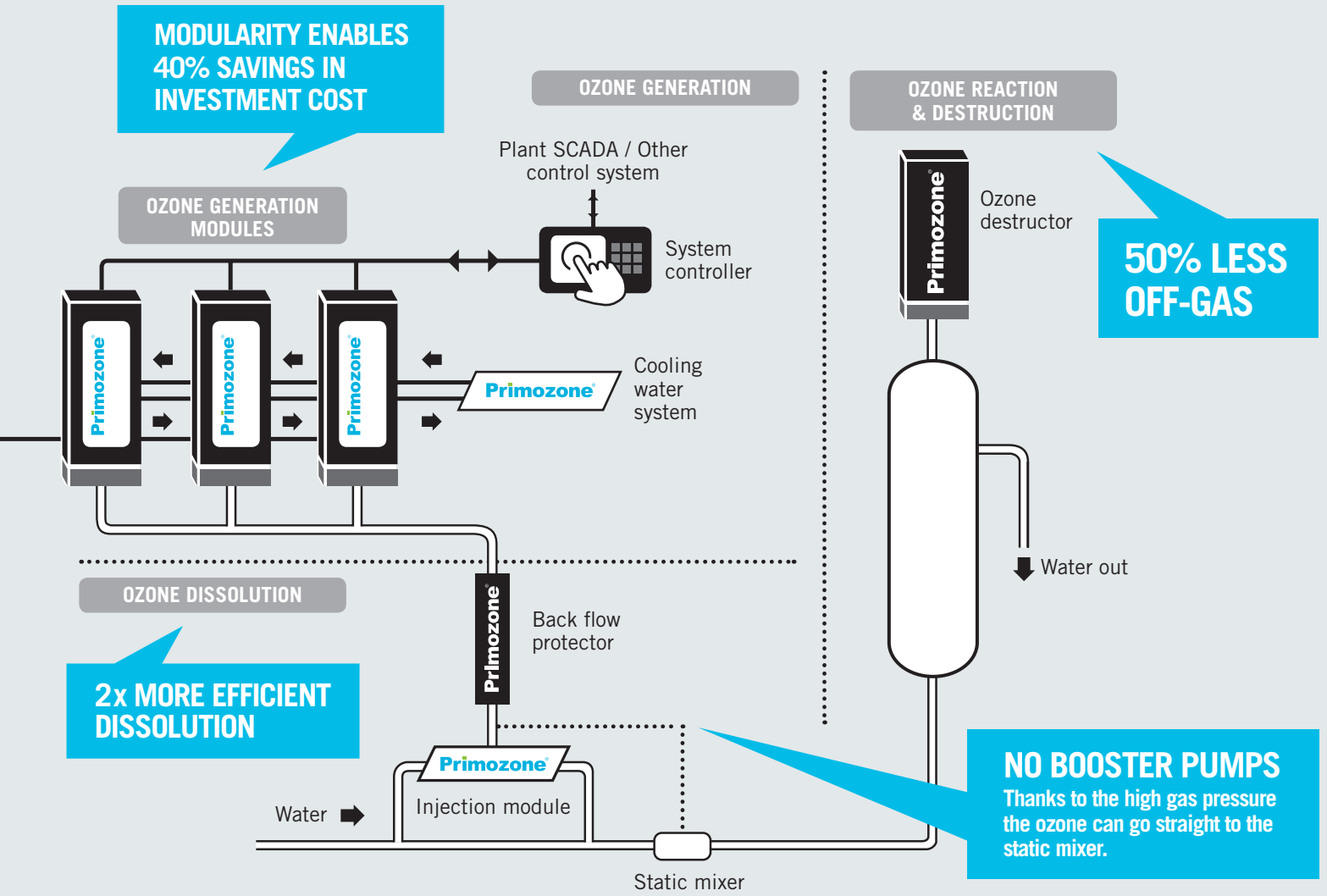
REDEFINING THE OZONE INSTALLATION

High ozone concentration, high gas pressure and modularity are the keys to the **SUPERIOR EFFICIENCY** of the Primozone solution, enabling key improvements to performance at different points in the system.



OXYGEN GENERATION

50% LESS OXYGEN CONSUMPTION


MODULARITY ENABLES 40% SAVINGS IN INVESTMENT COST
OZONE GENERATION
OZONE REACTION & DESTRUCTION
Plant SCADA / Other control system
OZONE GENERATION MODULES
System controller
Primozone
Ozone destructor
50% LESS OFF-GAS
Cooling water system
Water out
OZONE DISSOLUTION
Back flow protector
2x MORE EFFICIENT DISSOLUTION
Injection module
Water
NO BOOSTER PUMPS
Thanks to the high gas pressure the ozone can go straight to the static mixer.
Static mixer

HIGH CONCENTRATION OZONE PRODUCTION

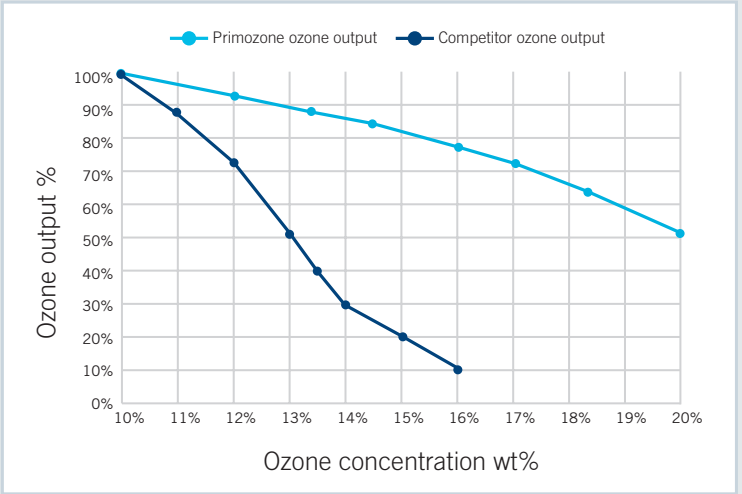
Primozone ozone generators produce **THE HIGHEST OZONE CONCENTRATION ON THE MARKET.** The Primozone method enables a more efficient creation of free oxygen radicals, which in turn makes it possible to create ozone with higher concentrations – up to 20 wt%.The unique high concentration enables use of less oxygen, which means that **LESS ENERGY IS NEEDED**.

Also worth noting is that with the Primozone technology, oxygen consumption will vary linearly to the ozone production – whereas traditional systems generate a constant gas flow regardless of how much ozone is produced. This means that **HALF THE AMOUNT OF OXYGEN** is used.

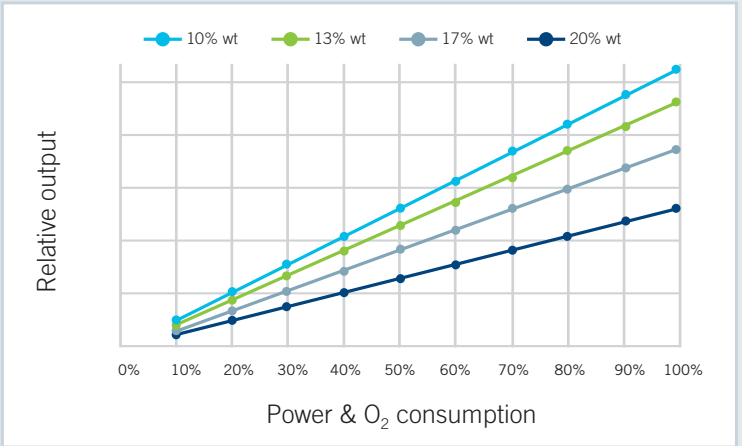
High concentrations, in combination with high pressures, are proven to be **MORE EFFECTIVE** at dissolving ozone in water. With Primozone, users will be able to meet their capacity needs using far less oxygen and energy. And since high concentrations of ozone mean smaller gas volumes, even the following ozone destruction benefits, requiring **LESS ENERGY TO ELIMINATE NON-DISSOLVED OZONE**.

Q: Will I still have off-gas with ozone that is infused in high concentrations?

A: Yes, but higher concentrations means smaller gas volumes, reducing the size and cost of the off-gas systems and the energy required.



Primozone technology has more than 7 times the production capacity at higher ozone concentrations than competitive technology. We provide both high ozone concentration and high ozone capacity/output.



The high ozone concentration is guaranteed independently of ozone output. Going from peak demand at 100% output to minimum demand at 10% the energy and oxygen consumption will correspondingly go down to 10%. In other words the ozone concentration is constant.

OZONE DISTRIBUTION AND DISSOLUTION

The Primozone difference is also based on the technology's ability to **EFFECTIVELY CHANNEL HIGH CONCENTRATION OZONE, WITH NO LOSSES,** to the dissolution point. Thus securing the required level of dissolved ozone in the water.

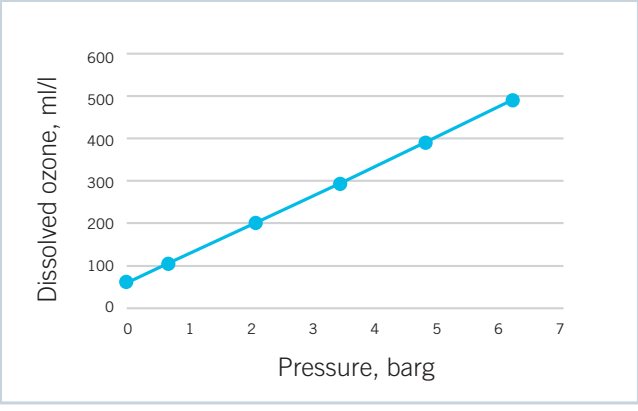
The high concentrations of ozone produced by a Primozone ozone generator means less oxygen in the mixture – and correspondingly **MORE EFFICIENT MASS TRANSFER** of ozone in the water.

Any system's pressure configuration will also have an impact on **DISSOLUTION**. The pressure in traditional ozone generators is low. Higher pressure leads to a much better mass transfer of the ozone into the water. Primozone technology creates an output pressure that is 3 times higher, enabling up to 95% more dissolved ozone in the water.

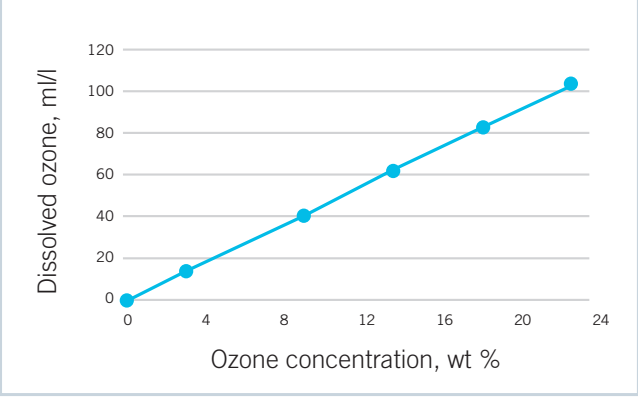
The reduced volume of gas created by having high concentrations of ozone also means a reduction in the booster pump capacity if needed – providing significant **OPERATIONAL AND INVESTMENT SAVINGS**.

Q: Does Primozone facilitate the distribution of ozone to more than one injection point?

A: Absolutely. From the Primozone ODM (ozone distribution module), operators can adjust the flow of each injection point, and even the corresponding ozone production changes – turning what used to be a day's work into an instant automated adjustment.



Amount of dissolved ozone is directly propotional to the pressure at any given temperature (here 10°C).



Amount of dissolved ozone is directly propotional to the ozone concentration at any given temperature (here 10°C).

HENRY'S LAW

"At a constant temperature, the amount of a given gas that dissolves in a given type and volume of liquid is directly proportional to the partial pressure of that gas in equilibrium with that liquid."

ADVANCED OZONE GENERATION CONTROL

The Primozone control philosophy makes it easy to confidently set ozone production levels and **MONITOR CRITICAL VALUES**. It provides a good overview of real time system operation parameters, such as oxygen and energy use, while also providing historical data that can be used to benchmark performance.

BUILT-IN ALARMS provide production disturbance alerts which are then logged automatically. Alerts can be set to be sent via sms, or to external control systems. The controller can also be accessed remotely (over the internet), giving the operator the same control they would have onsite.

MODULARITY – CHANGE THAT CHANGES EVERYTHING

For larger applications, traditional ozone thinking means high volume ozone generators designed to meet peak capacity needs. And duplicates to back them up.

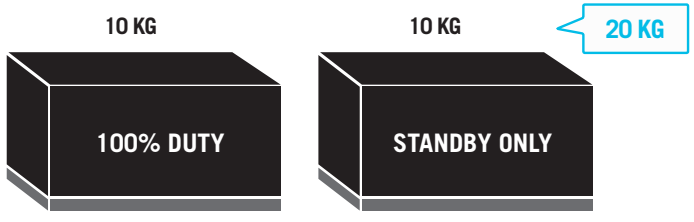
With Primozone ozone generators, **MEETING PEAK CAPACITY** is spread over a number of modules. There is no reason to oversize. Needless to say, the space and capital investment savings this represents can be significant.

The modular design also means Primozone generators are **EASY TO RETROFIT** into an existing facility – their smaller size will easily fit into the space needed for traditional ozone generators. As your needs change, you can simply add a new Primozone module to meet it.

RE-THINKING REDUNDANCY

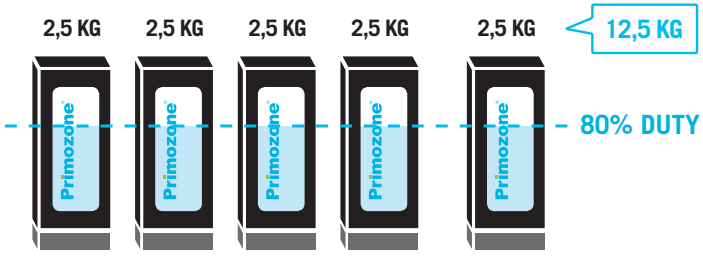
THE TRADITIONAL WAY

HOW MUCH POWER AND OXYGEN DOES YOUR OZONE GENERATOR CONSUME IN STAND-BY MODE?



THE RUNNING BACK-UP™ CONCEPT

REDUCES CAPEX BY 40%



The modularity of the Primozone technology **ELIMINATES THE NEED FOR STAND-BY**. Conventional ozone generators require installation of a costly duplicate of each ozone generator for back-up.

With Primozone's **RUNNING BACK-UP™ CONCEPT** this stand-by unit is redundant. The Running Back-Up assures that installed ozone generator modules operate at a lower % of their maximum capacity to meet the designed production rate and can be scaled up if the need for increased capacity arises. When running an ozone system of multiple units, the need for redundancy can be as low as 20%. That is 4 units for the demand and 1 unit for backup capacity, with all units running at the same time, but at a reduced duty level of 80% (4/5). **RECOVERY TIME** is minimal.

LESS ENERGY, LOWER OPEX

THE INNOVATIVE RETHINK of ozone technology yields impressive savings in energy use and costs compared to traditional ozone solutions:

- Less oxygen consumed – less energy needed, lower oxygen equipment costs, lower consumable costs
- Lower gas volumes – less energy needed for booster pumps for injection and for ozone destruction
- Higher ozone concentrations – more efficient dissolution in water per energy unit consumed
- Integrated reactor cooling – no need for air conditioners or the energy to operate them

Whether you are planning an installation or just curious about Primozone ozone technology, do not hesitate to contact us at any time, or to visit us at www.primozone.com

REDEFINING OZONE TECHNOLOGY

Primozone®

Primozone began redefining ozone technology in 2000. Since 2003, Primozone Production AB has been wholly owned by Westfal-Larsen Technology of Bergen, Norway. Today Primozone's patented technology is used in water treatment installations in more than 40 countries worldwide.

www.primozone.com