

Using a natural element to keep water safe



CAPITAL CONTROLS® OZONE GENERATORS

MARINE

ENERGY

MUNICIPAL

INDUSTRIAL





CAPITAL CONTROLS® Ozone Advantage

- Unparalleled experience

- Design and installation of ozone systems since 1970 with thousands of references

- Process expertise

- Experience across a full range of applications

- Flexible solutions

- A full range of ozone systems up to 113 kg/hr (6000 lb/day)
- Full systems or component options
- Individual fuse protection or electronic control

- Research and development / innovation capability

- >3% revenues reinvested in R&D plus centres of excellence for all products
- On-skid and containerized plug and play pilots available

- Service and aftersales peace of mind offering

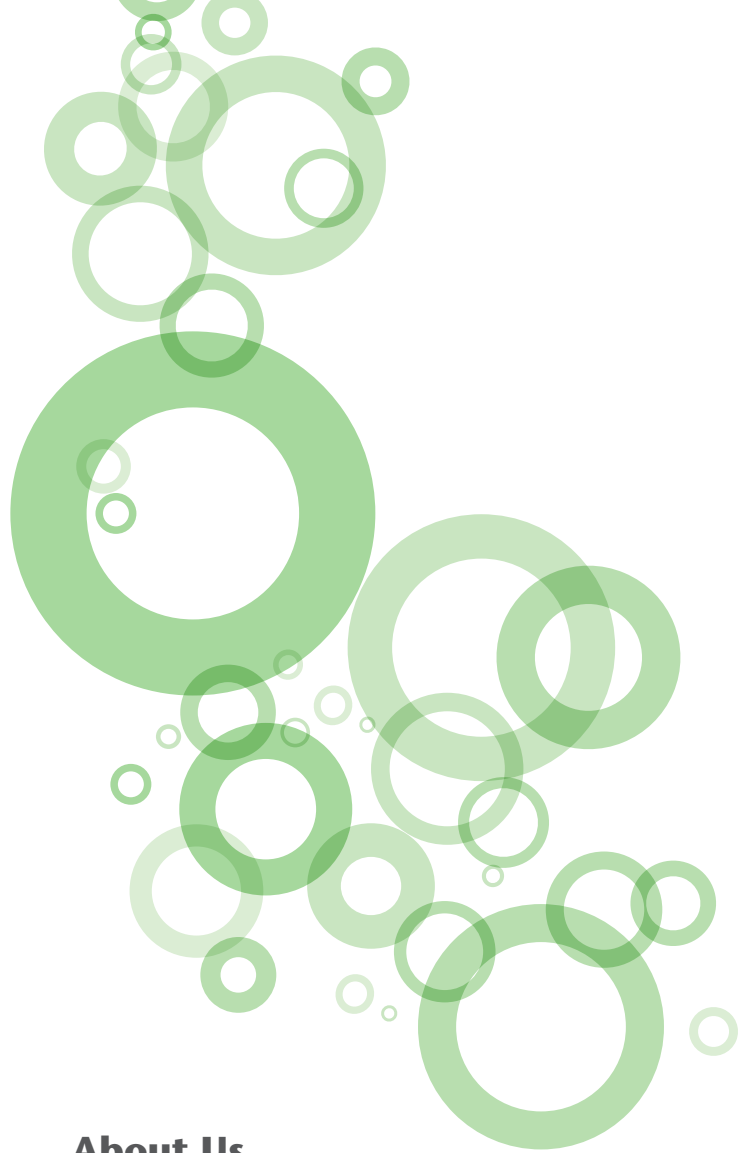
- De Nora's comprehensive aftersales support package
- Standard parts makes aftersales support easier, quicker and less expensive

- Reliable, trusted and effective solutions

- Thousands of long standing installations with minimal maintenance requirements
- Installations meeting treatment requirements for decades to the tightest levels
- Low cost of ownership thanks to innovative design

- Global reach

- 23 offices worldwide and a range of supporting partners



De Nora has been delivering ozone generators since 1970 and supports customers throughout the process - all you need is a supply of water and electricity and we'll do the rest.

About Us

Long history of ozone experience:

With more than 45 years of dedication to solving some of the toughest problems and treating some of the most difficult pollutants such as hydrocarbons, surfactants and phenols, De Nora Water Technologies is one of the original pioneers of ozone treatment solutions for industrial applications.

Ozone offers a range of advantages:

- No residuals to create disinfection by products
- Fast reaction time
- No chemical compounds required - generated by air or pure oxygen
- Can be produced on-site as required
- The strongest natural oxidant

Close to you – everywhere:

Being a part of De Nora, a global organisation with employees experienced across marine, municipal, energy and industrial markets worldwide, means you benefit from access to a global network of knowledgeable technical and after-sales support.

Flexible and tailor-made solutions

De Nora listens and works closely with you to develop and supply the best available solution for your needs.

Performance you can trust

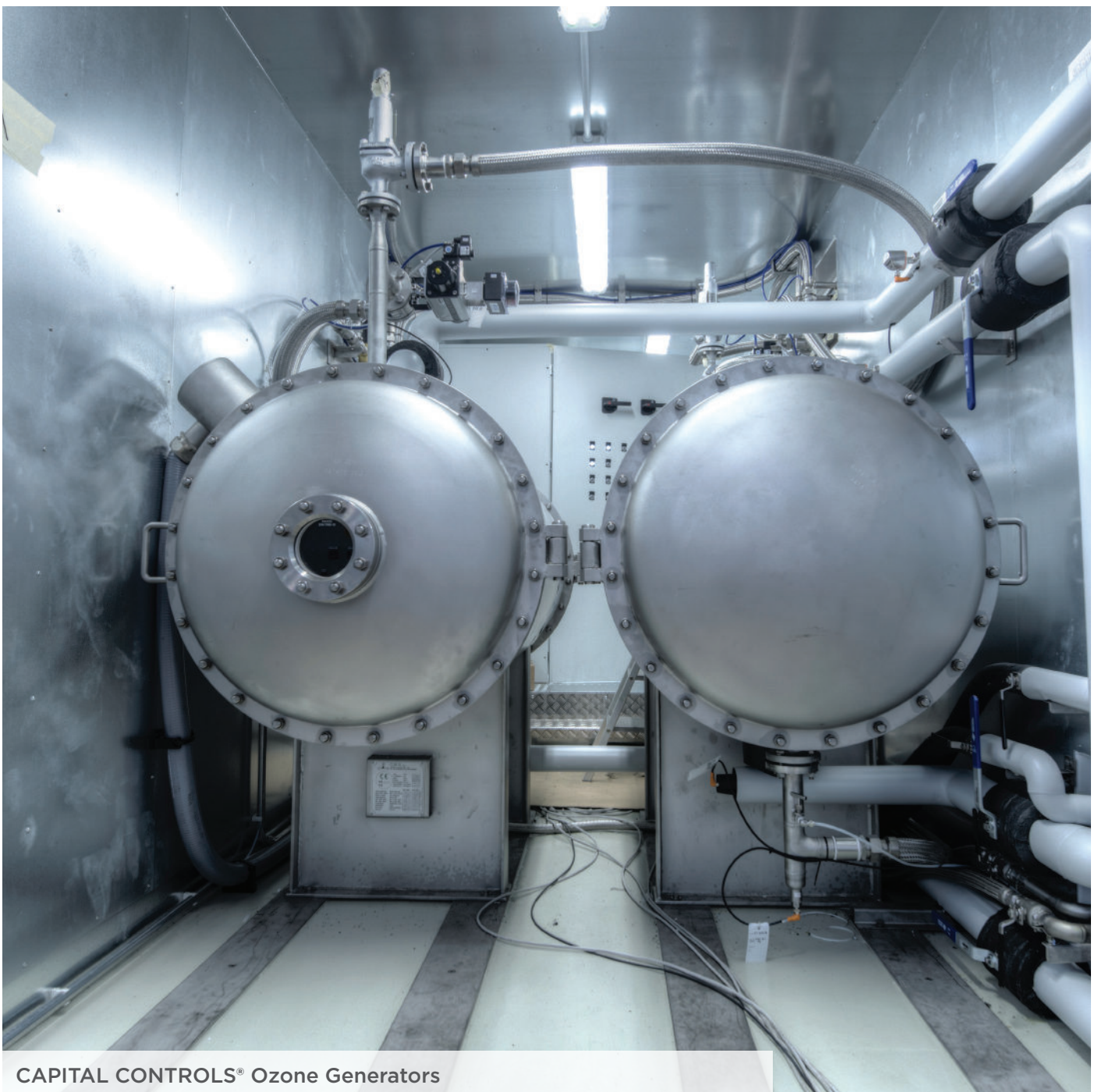
De Nora offers a reliable solution to maximise ozone concentration while minimising energy requirements.



Disinfection & Oxidation Solutions

CAPITAL CONTROLS®

Ozone offers a host of benefits and is a flexible solution for a number of applications. De Nora offers reliable, robust and proven ozone solutions to ensure our customers' peace of mind and is backed up by extensive global experience across a range of applications.



CAPITAL CONTROLS® Ozone Generators

Municipal Drinking Water

Thanks to excellent disinfection and oxidation qualities, ozone is widely used for drinking water treatment. Ozone can be added at several points throughout the treatment system, such as during pre-oxidation, intermediate oxidation or final disinfection. Usually, it is recommended to use ozone for pre-oxidation, before sand filters or with active carbon filters (GAC).

Municipal Wastewater

Ozone is generally used as final stage for colour and odor removal, but also for oxidation of specific pollutants and final disinfection.

- **Wastewater final polishing and disinfection:** disinfection, odor and color removal, cyanides, phenols and complex organic molecules oxidation. A final ozone treatment enables water reuse for applications such as irrigation and wash-water.
- **Ozone and Biofiltration:** the combination of DE NORA TETRA™ and CAPITAL CONTROLS® technologies to achieve a high quality and reusable water. COD, BOD, TSS, complex organic molecules such as micropollutants and nitrogen compounds are removed via a single final polishing stage.

AOP (Advanced Oxidation Process)

Pollutants and molecules are becoming more and more complex and standard processes or stand alone technologies are not enough.

For difficult industrial applications, De Nora combines ozone and/or ultraviolet, peroxide and electrochemistry to design cost effective advanced oxidation processes that through OH radicals formation can treat very hard pollutants and complex molecules. De Nora Ozone can perform laboratory tests or on-site analysis through to specific pilots plant to define the most effective combination of technologies.

Micropollutant treatment

Treating endocrine disrupting compounds (EDCs) in pharmaceutical and agriculture wastewater.



The De Nora Advantage:

- Full ozone application experience
- Robust, reliable designs
- **O3 SAFEGUARD - Fused or electronic control options give greater redundant cost advantages**

Biological Sludge Reduction

Biological sludge disposal is one of the major costs for a wastewater treatment plant. Biological Sludge Oxidation treats a partial stream of the return sludge and can significantly reduce operating costs: reduction of up to 40-50% of additional sludge requiring disposal, 30% of chemicals for sedimentation and flocculation, 30% of dewatering costs, 25% of filtration costs, 25% of transport costs and 90% reduction of filamentous bacteria (main cause of foaming and bad bulking) is achievable.

Primary and Process water:

Oxidation of iron, manganese and organic compounds contained in well water for drinking purposes or as process water.

Industrial Wastewater

Industrial wastewater is characterized by specific pollutants that cannot be treated simply by traditional biological and chemical processes.

- Wastewater Final Polishing
- Biological Sludge Reduction

Swimming Pools & Spa

Ozone can be used for private, municipal or commercial swimming pools.

Air and Gas Treatment

Odor Removal

NOx Reduction

Food and Beverage

Ozone can be used as a gas or dissolved in water for a range of applications

- **Drinking water disinfection:** filling machines and bottles washing by ozonated water.
- **CIP (Cleaning-In-Place)** circuit disinfection and biofilm formation prevention.

The CAPITAL CONTROLS® Ozone Offering

Flexible solutions

De Nora has a comprehensive range of ozone systems. We can provide everything from individual components through to complete systems as well as the guidance and advice you'd expect from a company with over 45 years of experience across a host of applications.

Solution Options

Feed Gas Supply

- Liquid oxygen (local gas supplier)
- PSA - Oxygen (On-site generation, Pressure Swing Adsorption)
- Air preparation: air compressor, desiccant dryer, filter
- VPSA - Oxygen (Vacuum Pressure Swing Adsorption)

Instrumentation and Control

- Devices for the management of Ozone concentration in gas phase and water
- Ambient gas monitoring with indication and alerting system

Cooling Water Supply

- Chilled water units
- Closed loop cooling water circuits with heat exchangers

Containerized System

- Insulated, painted and air-conditioned container
- Easy adoption of safety standards due to confined area approach
- Plug & Play approach

Ozone Mixing and Contacting

- Side stream injection systems
- Fine bubble diffusers
- Closed reactors
- Degassing tanks
- Demistors

Electronic Process Control

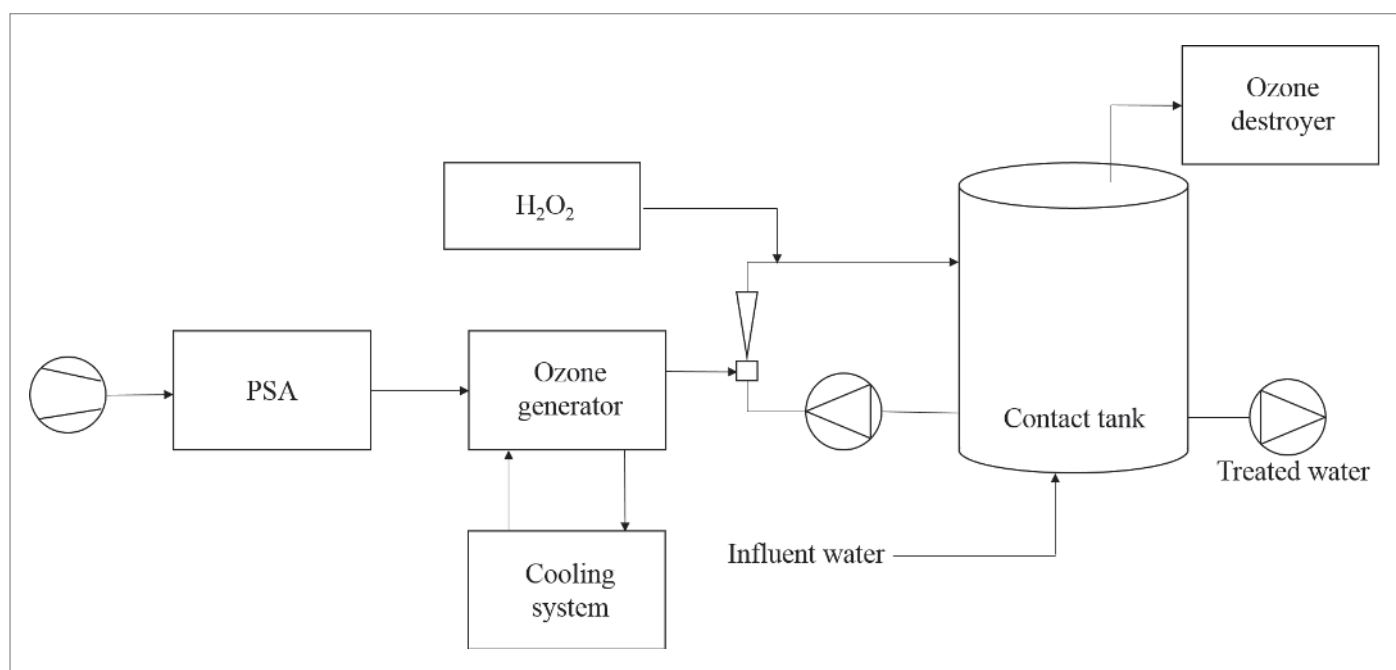
- Power Distribution Panels
- Main PLC, available with a selection of brands

Ozone Destruction in Off Gas

- Thermal and Catalytic Ozone Destroyers
- With or without Blower

Aftersales Support

- A range of flexible and comprehensive solutions from our "peace of mind" offering to ensure optimum operation of your assets



MCP Series

The CAPITAL CONTROLS® MCP range is the smallest size range of ozone generators from De Nora. Ranging from 40 g/h to 1400 g/h of ozone across five different model sizes, systems offer flexibility, simple maintenance and a host of other operational features to ensure maximum uptime and cost effectiveness. All systems have a compact design and are integrated into a painted stainless steel cabinet, which also includes the air feed gas drying system for ozone production from air. Water cooled ozone generator and air cooled PSU.



TPF Series

The CAPITAL CONTROLS® TPF range is the mid-size range of ozone generators from De Nora. Thirteen different models produce between 1 kg/h and 37 kg/h of ozone in concentrations between 2% wt and 15% wt. Flexible systems offer a range of features to ensure simple maintenance, maximum uptime and cost effectiveness. All systems have a compact design and are skid mounted up to 18 kg/h and include the air feed gas drying system for ozone production from air. Water cooled ozone generator and air cooled or water cooled PSU.

DTPF Series

The DTPF is the large size of ozone generators from De Nora. DTPF systems are able to produce up to 113 kg/h of ozone with ozone concentrations between 2% wt and 15% wt. Ozone generator and PSU water cooled.



Drinking Water Treatment
3x12 kg/h by oxygen

The De Nora Advantage:

- >45 years experience
- Reliable, proprietary XLT dielectric is easy to maintain
- Standardised components are easy to source
- Flexible design options as components or systems

Containerized Solutions

Containerized tailor made and customized complete solutions including feed gas preparation system, ozone generator, pump-injector or diffusion contact system, safety and process monitoring, MCC for power distribution and Main PLC for complete process management.



Refinery Wastewater Treatment
AOP ($O_3 + H_2O_2$) 1x3,5 kg/h by oxygen



AOP Wastewater Treatment
1x17 kg/h by oxygen

MCP	Ozone Capacity		Cooling Water Demand		Weight		Dimension (Depth x Width x Height)	
	g/hr	lb/day	m³/h	gpm (US)	kg	lbs	mm	inch
1	up to 100	up to 5.5	0.14	0.62	150	330.7	600 x 800 x 1960	23.6 x 31.5 x 77.2
2	up to 200	up to 10	0.28	1.23	160	352.7	600 x 800 x 1960	23.6 x 31.5 x 77.2
4	up to 400	up to 20	0.6	2.65	350	771.6	600 x 800 x 1960	23.6 x 31.5 x 77.2
7	up to 700	up to 40	< 1.0	< 4.4	470	1036.1	600 x 800 x 1960	23.6 x 31.5 x 77.2
14	up to 1400	up to 75	< 2.0	< 8.8	600	1322.7	600 x 800 x 1960	23.6 x 31.5 x 77.2



TPF	Ozone Capacity		Cooling Water Demand		Weight		Dimension (Depth x Width x Height)	
	kg/hr	lb/day	m³/h	gpm (US)	kg	lbs	mm	inch
19	up to 1.9	up to 100	1.7	7.5	2000	4409	2000 x 1550 x 2160	78.7 x 61 x 85
26	up to 2.6	up to 140	2.4	10.6	2100	4629	2100 x 1600 x 2160	82.7 x 63 x 85
37	up to 3.7	up to 200	3.3	14.5	2340	5159	2100 x 1600 x 2160	82.7 x 63 x 85
61	up to 6.1	up to 330	5.5	24.2	2800	6173	2200 x 1855 x 2160	86.6 x 73 x 85
91	up to 9.1	up to 480	8.2	36.1	3200	7054	2250 x 1900 x 2160	88.6 x 74 x 85
127	up to 12.7	up to 680	11.4	50.2	3500	7716	2400 x 2115 x 2150	94.5 x 83 x 84
158	up to 15.8	up to 850	14.2	62.5	4060	8950	2500 x 2265 x 2230	98.4 x 89 x 87
182	up to 18.2	up to 1000	16.3	71.8	5300	11684	2500 x 2265 x 2230	98.4 x 89 x 87
240	up to 24.0	up to 1300	21.6	95.1	Unit Dimensions for Ozone Generator (max.) 1800 x 1600 x 2300 Dimensions for Power Supply Unit (max.) 1600 x 4000 x 2300			
271	up to 27.1	up to 1450	24.3	107.0				
308	up to 30.8	up to 1650	27.6	121.5				
336	up to 33.6	up to 1800	30.2	133.0				
374	up to 37.4	up to 2000	33.6	147.9				



DTPF	Ozone Capacity		Cooling Water Demand		Weight		Dimension (Depth x Width x Height)	
	kg/hr	lb/day	m³/h	gpm (US)	kg	lbs	mm	inch
91	up to 18.2	up to 100	16.3	71.8	Separate arrangement for generator and PSU			
127	up to 25.4	up to 1350	22.8	100.4				
158	up to 31.7	up to 1700	28.5	125.5				
182	up to 36.4	up to 2000	32.7	144.0				
240	up to 48.0	up to 2500	43.2	190.2				
271	up to 54.2	up to 2900	48.76	214.7				
308	up to 61.6	up to 3250	55.4	243.9				
336	up to 67.2	up to 3550	60.5	266.4				
374	up to 74.8	up to 4000	67.3	296.3				
440	up to 88.0	up to 4650	79.2	348.7				
550	up to 113	up to 6000	99	435.9				



Cooling Water Demand at design conditions: Cooling water at 15°C (59°F) - flow rate is according to the specific ozone production and concentration.

Note: Performance based on Oxygen feed gas (PSA or LOX), performance on Air feed is different.

Member of:



DE NORA WATER TECHNOLOGIES



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