

Case Stories

Primozone[®]
Clean water. The **natural** way.[™]



⋮ Municipal

Primozone[®] solves problem with filamentous sludge

Öresundsverket WWTP has with the installation of the Primozone ozone plant been able to reduce problems with filamentous sludge and at the same time increase capacity on water throughput.

At Öresundsverket WWTP in Helsingborg, Sweden, they have problems with filamentous sludge during springtime, as do many other activated sludge plants. With ozonation of the return sludge flow Öresundsverket has drastically reduced the amount of filamentous sludge and significantly increased the quality of the water – and this without any negative impact on the nitrification or the biological phosphorus separation.

Ozonation

Ozone is a very strong oxidant and therefore a very good method for treating wastewater. In the treatment of sludge containing filaments the ozone breaks up the filaments and improves the settling characteristics of the sludge, without any negative effect on the important nitrification process.

Pilot projects

To find out more about ozonation of filamentous bacteria and ozone's impact on the other biological processes, NSVA chose to start with a pilot project. Öresundsverket's activated sludge plant is optimally designed to run pilot tests as the cleaning process is divided into four completely separate treatment lines.

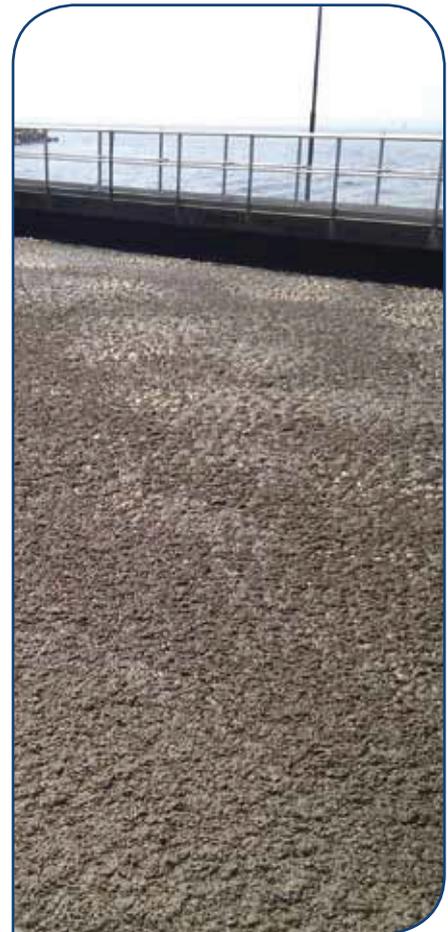
Results

The pilot project gave clear results in comparison with the untreated lines. Sludge Volume Index was reduced dramatically, while the biological processes were not affected. Marinette Hagman, who is specialist in Development & Benchmarking at NSVA is very satisfied with the results.

“In the line that was treated with ozone there is almost no foam or sludge on the surface compared with the untreated pools. Whether the problems in the digester are reduced, we cannot say anything about because sludge from all the lines is mixed before the reactor,” says Marinette Hagman. However it is reasonable to assume that these problems would disappear if all lines were treated.

Small and efficient

The Primozone SM900 is a complete ozone plant housed in a small container. At Öresundsverket the plant was complete with a dissolution system and a reaction tank. The container solution means that you do not need a new or existing building to install the plant. In addition, it can easily be placed close to the activated sludge process and even be moved to another facility.



Primozone reduces Ljungskile Water's energy bill

Ljungskile was faced with unacceptably low ozone availability due to weakness in power supply and an old design in the generator systems that could not cope with power spikes.

In June 2006, Primozone delivered a completely new ozonating system consisting of oxygen generator, ozone generator and mixing system. Installation took less than one working day.

Since the Primozone GM-18 generator was installed, the plant has been constantly in operation, despite severe disturbance in the public energy supply.



Ljungskile WTP during installation of the Primozone GM18.

The Waterworks requested a second train of oxygen + ozone generator to be installed in 2008 due to the increasing content of organic material in the raw water. We installed the system in April 2008, with only 20 minutes of downtime. After two and a half years the

system is still working perfectly without any breakdowns reported.

The plant manager at Ljungskile WTP, Mr Daniel Lingbrand is very satisfied and says "Since we installed the Primozone ozone generator system we have got rid of the severe disturbances in the ozone production due to the somewhat "dirty electricity" that we have here. Furthermore has our electricity bill been halved and at the same time we get twice the volume of ozone. We are very happy indeed with the Primozone ozone generator system".

"We are delighted that Ljungskile water chose us to supply a second generator to increase ozone dosage to combat an increase in the growth of organisms in the water. This demonstrates the reliability and cost-efficiency of our systems. They are perfect for replacing older, less efficient ozone generators". Says Dan Johansson, Primozone's Sales and Marketing Manager.

Problem

- Very high humus content which severely colours the raw water. High iron content in the raw water which gives colour to the water and may discolour clothes for instance, if used for washing.
- Somewhat dirty electricity supply from the grid causing disturbances in the operation of the old ozone generators
- A wish to reduce the energy consumption

Solution

- The high dose from 2 pcs of Primozone GM18 with high ozone concentration (200 g O₃/NmO₂) breaks down the humus so it easily can be filtered out. The ozone oxidizes the iron, which then can be filtered out.
- The energy supply units of the Primozone GM18 can cope with the "dirty electricity" and gives a smooth continuous operation of the ozone generators.
- The energy consumption has been reduced with more than 50% still the volume of produced ozone is doubled.



Ålands Water chooses reliable Primozone system

Primozone Production AB installed a new ozone treatment system on the island of Åland in June 2007.

The plant supplies 475 m³/h of drinking water to the population of Mariehamn, which is the larger part of Åland's 27.000 inhabitants, and which doubles during the summer season. Åland is an archipelago of 6.500 islands. The process disinfects the water and removes colour and taste from humus.

Primozone replaces three air-fed generators

The turnkey delivery consisted of two independent lines, each with:

- Ozone generator Primozone GM 18, rated at 900 g O₃/h with ozone concentration of 200 g O₃/ Nm³O₂
- Oxygen generator Oxymat O 100, rated at 6,1 Nm³ O₂/h at 4 bar (g) with purity > 93 %
- Compressor Kaeser SM 12, delivering 1200 l/min at 7.5 bar
- Venturi mixing system Mazzei 4091 SS

The plant has been running without interruption and supplied drinking water of excellent quality since Primozone installed the new treatment system.

The MD at Ålands Vatten AB, Mr Christian Nordas says "When the old ozone generators were worn out we decided to replace them with a new generation of

ozone generators from Primozone. The Primozone ozone generator system is very reliable and has since the installation worked very well indeed. The production of both ozone and oxygen gas exactly follows the fluctuations we have in the water flow which means that the energy consumption has decreased substantially compared with the old system. We are very happy indeed."



Find out more about Ålands Vatten at www.vatten.aland.fi

Problem

- Raw water taken from a lake. The water contains blue algae's and humus. The algae's can be poisonous and the humus gives colour to the water.
- To create a barrier against bacteria's, virus, algae's and parasites.
- A wish to reduce the electricity consumption.

Solution

- Part of the ozone from 2 pcs. of Primozone GM 18 supports the flocculation process for humus, meaning that less chemicals needs to be used in the first filtration step.
- Part of the ozone from 2 pcs. of Primozone GM 18 is used to create a barrier killing bacteria's, virus, algae's and parasites. The biological waste is then filtered out via a granulated active carbon filter.
- The electricity consumption has been reduced considerably.



⋮ Aquaculture

Primozone[®] increased production at Swiss fish farm

The Swiss fish farm Valperca experienced problems with water quality in a recirculation system and could not produce fish at designed capacity. With the Primozone Ozone Water Treatment Solution the water quality improved within a couple of days.

Valperca is a Swiss fish farming plant situated in the beautiful Valais valley. They produce perch, which is considered a delicacy in Switzerland. The perch command a high price as the supply of wild perch is not large enough to satisfy the market. The Valperca plant has the capacity to breed 300 tons of perch per year.

In May 2010 Primozone was contacted by Valperca who was experiencing problems with the ozone system they had installed in a recirculation systems only a few months earlier. The capacity of the ozone system was not sufficient to keep the water clean for the designed volume of fish. Valperca was only able to use part of its production capacity. The water was not cleaned properly, the redox values were too low and the organic load too high in the fish tanks. As a result the fish did not grow according to plan.

In October 2010 Primozone delivered a customized Ozone Water Treatment System to Valperca who, after only a couple of day, experienced a much better quality of the recirculating water. "The design of our old ozone system was not optimal, which meant that we did not

get the desired cleanness and clarity of the water", says Mr. R. Moser, manager at Valperca. "Primozone was very helpful and designed a complete system for us with ozone generator, dissolution system and reaction tanks. It all works very smoothly as the Primozone Ozone Generators are connected to and controlled by our redox meters and the ozone levels are controlled automatically."

"When the system was installed the redox value increased instantly and after only a couple of days we had reached



the desired water quality. Both delivery and installation was made according to plan and without any disruptions. We are very pleased with Primozone and their Ozone Water Treatment System." concludes Mr. R. Moser.

Problem

- High levels of organic pollutions and fungus made the water unhealthy for the fish.
- Lack of capacity in the current ozone system to handle the organic load in the recirculating water.
- Limited production capacity of fish due to risk of unhealthy levels of organic matter.

Solution

- Primozone designed and delivered a complete Ozone Water Treatment System consisting of:
 - Primozone[®] Ozone Generators
 - Dissolution systems
 - Dissolution/reaction tanks

Result

- Cleaner water and control over organic load and fungal growth.
- Increased redox values made it possible to increase fish production to designed capacity.
- Thanks to the Primozone system the whole water treatment system now works much more effectively.



Sophisticated control system - effective ozone generator

At the Freshwater Institute in Shepherdstown, West Virginia (USA) they are convinced that ozone water treatment is essential to optimize production in water recirculating aquaculture systems (RAS). Scientists at the Freshwater Institute have been studying ozonation for years but have never before used such a sophisticated ozone generator as the Primozone® Ozone Generator.

The Freshwater Institute works to develop and validate solutions for the sustainable use of water resources.

Recirculating aquaculture systems

As a part of the Freshwater Institute's work to find sustainable solutions for fish farming, they have their own water recirculating aquaculture facility and do primarily research on the production of fish as a food source. They focus on growing Atlantic salmon, Arctic char and Rainbow trout. The Freshwater Institute is one of the worlds leading research institutes for RAS.

Control of ozone dosage

The Primozone Ozone Generator and the Primozone System Controller has unique features that make it possible to control the exact ozone levels produced at any given time. The oxygen levels and the effect used will vary accordingly, thus saving energy. The System Controller allows for monitoring of ozone levels, oxygen flow and power concentration.

It's working fantastic!

Dr. Steven Summerfelt at the Freshwater Institute is very happy with how the Primozone Ozone Generator works.

"Our new Primozone ozone generator is working fantastic! We love being able to program in the ozone dose in g/hr and still minimize the oxygen flow required for ozone production. Being able to directly read the oxygen flow rate in L/min is also of great value to us!"



"The Primozone Ozone generator has spoiled us and we don't want to ever use anything less sophisticated," says Dr. Steven Summerfelt, Director of Aquaculture Systems Research at the Freshwater Institute.

Freshwater Institute

- A research partnership between the U.S. Department of Agriculture's Agricultural Research Service and the Freshwater Institute has refined a new model for fish farming, RAS that are closed-containment systems, ones that can produce healthy fish, leave a healthy environment and be done almost anyplace, even far from large water resources.

Ozone at RAS

- Ozone improves water quality, thus reducing fish health problems.
- Ozone removes color and dissolves organic matter and micro-flocculates fine particulate matter.

Primozone Solution

- High ozone concentration 200g O3/Nm3 O2
- Small and space efficient
- Quiet
- Sophisticated control system
- Control of exact ozone dosage can be set to desired ozone g/Hr
- Control of oxygen flow rate
- Can be placed in any location, no risk for powerful electromagnetic fields (EMC-approved)



⋮ Industrial

Primozone® replaces ozone generators at E.ON plant

E.ON Benelux NV has replaced its existing ozone generators with Primozone® Ozone Generators for treatment of recirculating water in cooling towers at one of its power stations in Rotterdam, Holland.

E.ON, one of the largest energy providers in Europe, have been using ozone for treating their cooling tower water for a decade. At its RoCa Power station in Rotterdam, Holland the existing ozone system was not working properly and E.ON gave Excellent Ozone System & Consultants BV the task to build a new 3000-gram ozone system.

Preferred supplier

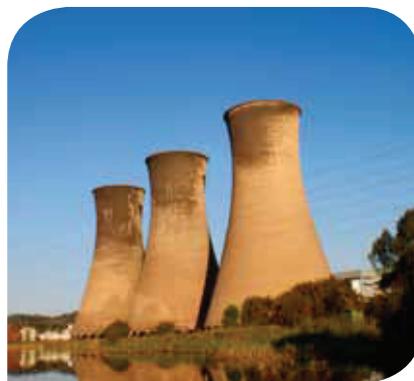
Excellent Ozone Systems choose to install four Primozone® GM ozone generators as a part of their ozone system.

“We had heard about the excellent performance of the Primozone Ozone Generator and its high ozone concentration and we wanted to supply E.ON with the best quality possible”, says Jeroen Lijkendijk, Account Manager at Excellent Ozone Systems. “The performance of the Primozone Ozone Generator has proven to be even better than expected and we are very pleased”.

Cooling tower water and ozone

The use of ozone in cooling tower water systems has several functions. The water for the E.ON cooling tower comes from a small river and contains bacteria and other contaminations when entering the system. These bacteria need to be destroyed to prevent bacterial growth in the cooling tower.

Ozone is a very strong disinfectant, it is much more efficient than chlorine on for example E. Coli bacteria and Legionella Pneumo-Phila. In addition it leaves no residue and the water can safely be let back out into the river. Ozone is



Example of cooling towers

therefore the most effective and environmentally friendly method of controlling the microbiology of cooling tower water.

Ozone also prevents biological deposits inside the cooling water tower and the heat exchangers, which otherwise can create problems like blocking and corrosion.

E.ON cooling towers

- 4 cooling towers
- Total capacity 204 MW
- Total recirculation 15 000 m³/h
- Supplementation of up to 2x190m²/h
- Surface water as supplement

Solution

- Ozone system with four Primozone® GM
- Design capacity 2x1500 gO₃/hour (+ / - 5%)
- Outlet pressure 3,2 bar
- Gas flow 15Nm³/h
- Concentration 200 g/Nm³ (13,4 wt%)
- Temperature: <30 °C
- Power consumption: 34.8 kW (11.6 kW per kg of ozone)
- Power supply: 400 V/3ph/50Hz

Result

- Control over microbiological environment and growth.
- Reliable ozone production
- High ozone concentration
- Lower energy consumption



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⋮ About Primozone

At Primozone we are committed to provide our customers with cost efficient and environmentally friendly ways to clean and treat water with ozone. Our ozone generator and ozone water treatment systems are based on cutting-edge technology and generate far more ozone while using far less energy.

Access to clean water is vital to our health and survival. But making water suitable for drinking and other commercial uses often involves purification methods that are in themselves harmful. Ozone is not only a natural product but also one of the most efficient methods to clean and treat water.

Ozone is formed by oxygen at high voltages, it is an unstable gas which, put simple, means that it quickly reverts to oxygen. This also means that the ozone needs to be generated on site by an ozone generator. Traditionally, ozone generators have been very large and consumed a lot of energy.

At Primozone we have found an innovative way to make ozone generation efficient and cost effective. Our solution has proven to save up to 70% of the energy consumption compared to conventional ozone generators. Furthermore the Primozone Ozone Generator is small and has the capacity to generate ozone with a proven high concentration.

Primozone is fully owned by the Westfal-Larsen Group. The Westfal-Larsen Group is an industrial owner and has invested several million Euros in the development of the Primozone Ozone Technology.

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